

1938

Sterile mating

Ray Hill

University of Nebraska Medical Center

This manuscript is historical in nature and may not reflect current medical research and practice. Search [PubMed](#) for current research.

Follow this and additional works at: <https://digitalcommons.unmc.edu/mdtheses>



Part of the [Medical Education Commons](#)

Recommended Citation

Hill, Ray, "Sterile mating" (1938). *MD Theses*. 662.
<https://digitalcommons.unmc.edu/mdtheses/662>

This Thesis is brought to you for free and open access by the Special Collections at DigitalCommons@UNMC. It has been accepted for inclusion in MD Theses by an authorized administrator of DigitalCommons@UNMC. For more information, please contact digitalcommons@unmc.edu.

STERILE MATING

by

Ray Hill

Senior Thesis presented to the College of

Medicine, University of Nebraska

Omaha, 1938.

TABLE OF CONTENTS

	Page
Definition of Terms	1
Incidence	2
Types of Sterility	2
Etiology of Sterility	3
Consideration of the Male	3
Deficient spermatogenesis	3
Obstruction and occlusion of the ducts	5
Faults of secretion	6
Faults of delivery	7
Consideration of the Female	7
Deficient oogenesis	8
Obstruction at the ovariotubal hiatus	9
Obstruction and occlusion of the ducts	10
Uterine blockade	11
Hostility of Endocervical secretions	12
Faults of reception	13
Study of the Problem of Sterility	13
Principles involved	14
Urological investigation	15
History	15
Examination of genitalia	15
Study of semen	16

TABLE OF CONTENTS

	Page
Study of secretions	17
Aspiration of testicles	17
Gynecological investigation	18
History	18
Abdomino-pelvic examination	19
Study of secretions	20
Huehner test	21
Study for hypoplasia	22
Transuterine Insufflation with CO_2	22
Study with Lipiodol	24
Medical Examination	25
History	25
Laboratory work	26
Endocrinological Examination	26
Introduction	26
Pituitary	27
Ovary	28
Thyroid	28
History	28
Physical examination	29
Laboratory work on female	30
Galactose test	30
Curettage	30

TABLE OF CONTENTS

	Page
Estrin in urine	31
Estrin in blood	31
Corpus luteum	32
Prolan A in urine	33
Prolan A in blood	33
Prolan B in blood	33
Prolan B in urine	34
Laboratory work on male	34
Male sex hormone	34
Treatment of the male	35
Deficient spermatogenesis	35
Obstruction and occlusion of ducts	39
Hostility of secretions	41
Faults of Delivery	41
Treatment of the female	42
Deficient oogenesis	43
Obstruction at the ovariotubal hiatus	44
Obstruction and occlusion of ducts	45
Uterine Blockade	47
Hostility of Endocervical Secretions	47
Faulty reception	49
Endocrine treatment	49
Pituitary	50

TABLE OF CONTENTS

	Page
Ovary	51
Thyroid	52
Adrenal	52
Islands of Langerhans	52
Prognosis	52
Prevention	54

STERILE MATING

STERILITY is the inability of a male and female living a normal sex life to initiate and complete the process of reproduction (17). Sterility and fertility are not separate and opposed entities (50). Fertility is of varying degrees and ranges downward from a normal point (50). If a male of high fertility is mated to a female of low fertility it is likely to be a fertile union, and the opposite is true. However, when two individuals of low fertility are united the likelihood of offspring is considerably lessened (17). Sterility is not a disease but a symptomatic result of one or more pathological defects not limited to the reproductive organs, but including nearly every metabolic process in our complex physiology (1).

Conception does not mean fertility as there must be a living child, or in other words, the end result is the same as if conception had not taken place (24). In the past there have been some conditions which prevented delivery but which may now be circumvented. For example, a woman with a narrow pelvis may be delivered by caesarian section whereas formerly she would have been sterile. The point at which a union is to be con-

sidered sterile deserves some comment. Many think that a union should be considered infertile when three years of cohabitation have passed without the use of contraceptives, and with the couple leading a normal sexual life (20).

The incidence of sterility is a much disputed point, and there will be some variation in statistics. Probably 10 per cent of English marriages fail to reproduce (4) and another 15 per cent end in miscarriage, so the final number will be between these two points and will more nearly approach the lower (22). The same is probably true of the United States (11). There is an estimated 2,000,000 childless marriages in the United States with the members of the union in the child bearing age (11). Only 10 per cent of males and 5 per cent of the females are free from all objective evidences of infertility (43). The husband bears the chief or partial responsibility in one-fourth of the marriages (31).

Classification of Types of Sterility.

The tabulation of the types may be simple or complex depending on the kind of study a man is capable of making. One fairly inclusive system of study is a division of cases into

Congenital Sterility. - This includes anatomical defects such as the absence of a vagina, an im-

perforate hymen, epispadias and hypospadias.

Acquired Sterility.

- a. Primary - These unions have no children (12).
- b. Secondary - These unions have one or more children but cannot have any more (15).

Absolute Sterility. - Sperm does not have access to the egg due to occlusions, blocks and no ovulation.

Relative Sterility. - This is due to inferior quality of eggs and sperms, or focal infections such as endocervicitis (36).

This paper will be confined to a discussion of congenital, primary acquired, absolute, and relative sterility.

Secondary acquired sterility involves the problems of post partum infections, post abortal infections and other causes too broad for the scope of this paper.

Etiology of Sterility.

Consideration of the male. - Since male causes of sterility are the most easily evaluated, this seems the logical place to attempt to introduce the subject of causation.

Deficient spermatogenesis. - There are many terms used to describe the deficiencies present under this topic. The lack of spermatozoa or aspermia may be present, few spermatozoa or oligospermia may be the con-

dition, or there may be dead spermatozoa or necro-spermia. Much study has been done on spermatozoa heads by Moench, and a high incidence of abnormal types is known as amorphospermia (42). The causes of deficient spermatogenesis are to be studied under testicular underdevelopment, functional inactivity and permanent damage to the seminiferous tubules.

Underdevelopment is most commonly caused by a failure of the testicle to descend, this as opposed to a failure of the seminiferous tubules to develop which would have nothing to do with the size of the testicle. Both of these conditions may be on a basis of failure of the anterior pituitary.

Inactivity of the seminiferous tubules takes place in testes that have attained normal development. This may be due to sexual excess, as in newly married couples, wasting diseases, sexual hyperesthesia when a stricture is present or to excessive masturbation (54). Large varicoceles may cause passive congestion with damage to the tubules and this would result in an oligospermia. Then there are constitutional factors which may cause the tubules not to function normally. Under this head would come a diet that is not properly balanced, in-

5.

sufficient exercise, focal infections, endocrine disfunctions and generally bad hygiene. The above factors must be evaluated in the light of the whole study as it is well known how some unions may reproduce easily in spite of bad hygiene or other factors mentioned above.

In conditions of underfunctioning of the seminiferous tubules the result is oligospermia, necrospermia or amorpospermia. In other words, spermatozoa are produced but in an insufficient number with not enough vitality or with changed morphology. Permanent damage comes from some disease condition of the testicle. The most common cause is mumps and it is estimated that a bilateral orchiditis results in 90 per cent sterility in the male. Other contributing factors are tertiary syphilis with a gumma of the testicle, and tuberculosis of the testes. In contrast to the aforementioned alteration of the spermatozoa picture in these cases, there is a complete absence of spermatozoa or an aspermia (16).

Obstruction and Occlusion of the Ducts. - This is probably the most common cause of sterility in the male (26). It is on an inflammatory basis almost exclusively, and consists of stoppage of the epididymis or vas deferens. Atrophy of the testicle seldom occurs in epididymitis, especially the kind associated with

gonorrhoea, so there is seldom absolute sterility from deficient spermatogenesis (27). Traumatic epididymitis rarely leads to sterility (26). In the bilateral type of epididymitis due to gonorrhoea the healing process leads to cicatricial formation in the region of the globus minor. This is the most dangerous part as there is but one efferent duct in this region and the spermatozoa have no way to leave the epididymis. This then prevents egress of the normal spermatozoa formed(27).

There may be a congenital block of the vas deferens which is a failure of the embryonic process of canalization to take place (42). Occlusion of the urethra distal to the veru montanum may be such as to allow insufficient quantities of semen to be thrown against the cervix (4).

Faults of Secretion of Prostate and Seminal Vesicles.
The major liquid portion of the semen originates in the prostate and seminal vesicles. This is the vehicle in which the sperms move, so changes in this cause changes in fertility. Undue viscosity may signify either increased production of prostate-vesicular mucous or decreased mucolytic power. The mucous is indicative of chronic infection or passive congestion of prostate and

vesicles (23). The absence of the mucolytic factor may make it impossible for the sperms to ascend the cervical canal as the mucous content of the canal has to be digested in order for the sperms to ascend.

Faults of Delivery. - These may be congenital, mechanical or neurological. The commonest congenital interference with fertility is misplacement of the urethral opening, that is hypospadias, or the more uncommon epispadias. The openings may be at any position on the penis, and the closer approximation to the base the higher the degree of sterility (42).

Mechanical faults of delivery are mostly associated with inability to perform the sex act correctly. This is a rather rare fault, but in analysis of 200 cases this was found to be a contributing factor in from 1 to 3 per cent.

Neurological causes as faults of delivery are even more rare, but when sympathectomies are performed there is as a result the inability to ejaculate but the orgasm is not affected. This means that boys should never have a sympathetic neuronectomy for Hirshsprung's disease as this would render them permanently sterile (32).

Consideration of the Female Causes of Sterility.

Deficient oogenesis. - This is a problem that has been very hard to approach even though it has been known for some time. There may be a juvenile ovary which is spoken of in the adult as hypoplastic. In this type there is enough development to carry on a normal cycle in the female, but there is no ovulation, or at best a small number of infertile ova, which, if fertilized, may give rise either to miscarriages or malformed offspring. The causation of this hypoplasia is in most cases an underfunction or unbalanced endocrine system. Thyroid failure is sometimes found in these cases. However, more often it is due to an insufficient secretion of the anterior lobe of the pituitary.

Another group of factors which should be considered but are hard to evaluate are, focal infection, syphilis, rickets, anemia, poor hygiene, and disorders of the central nervous system, all of which contribute to delayed development in the female. Here again may be an endocrine problem because these factors may produce their depression on the hormone producing glands.

A second contributing cause of deficient oogenesis is an underfunction of the ovaries due to chronic passive congestion, prolapse of the ovary into the pelvic cavity, or a thickening of the tunica albuginea.

This thickening may be due to an anatomical congenital thickening, or perhaps to an adjacent inflammatory condition. Ovarian cysts, especially if they are multiple, may also contribute to such a condition.

Permanent damage to the ovaries may be a possible cause of deficient oogenesis. Inflammatory changes due to abscesses in the region, a sequel to parotitis, may be a factor. Tumors may invade the ovary so there is a destruction of the whole ovarian tissue. X-ray often brings about a complete cessation of ovulation as will also radium placed in the vaginal vault or uterine cavity. Factors such as these may be very important in the working out of a case of sterility.

Obstruction at the Ovariotubal Hiatus. - Anything which would interfere with the passage of the egg from the ovary to the fimbriated tubal opening would be a factor. Probably the most common condition would be inflammation or the sequel to inflammation, adhesions. One would also have to consider malformations of development such as abnormal peritoneal folds which would deflect the egg away from the open tubal end. An interesting factor to postulate is the fact that the upright position assumed by the race may allow the force of

gravity to act as a barrier, either by prolapsing the ovary or by increasing the difficulty of the egg to approach the tube.

Obstruction and Occlusion of the Eucts. - Defects in tubal patency exist in degrees. By this is meant that there may be anything from a temporary blocking due to mucous to a permanent obliteration from an inflammatory process. This blocking whether it be partial or complete may occur at any place in the tube or throughout its entire length. These defects in patency may be caused by such extrinsic factors as adhesions which cause kinking, uterine fibromyomata which cause flattening of the tube, or by surgical operations in the vicinity. There may be secondary congenital faults as absence of tubes or parts of tubes, or a lack of canalization. The latter probably is not common, but is known to exist.

Chronic passive congestion may cause an edematous condition of the tubes which would make it impossible for an egg to descend or a spermatozoa to ascend the tubes. It is thought that there may be a fairly high incidence of such blockade because of the response to tubal insufflation.

Inflammatory damage to the tubes is the commonest cause of blockade and may be due to any type of infection.

Gonorrhoea is the usual offender and the most serious from the standpoint of sterility. The fimbriated end may be sealed or the block may be at any point along the tube. Other inflammatory conditions which have a similar effect are tuberculosis or puerperal and post abortal infections. The latter literally bury the tubes in adhesions. Appendicitis may cause an inflammatory blockade in a small number of cases (42).

Muscular spasm is often mentioned as a cause of tubal blockade, but there is doubt in the minds of some commentators as to whether it is a cause of sterility. It is hard to visualize how spasm could be so complete that the way would be barred to the migration of a spermatozoon or an egg when the mucous membrane of the tube is thrown into so many convolutions. Tubal insufflations prove the presence of spasm but do not prove the relationship of spasm to sterility.

Uterine Blockade. - This type of block is most important when it prevents the passage of the sperms to the tubes. This might be due to a congenital absence of the uterus or a stricture, but the factor most commonly present is tumor, usually of the fibromyomata type. This type occurs in the older sterile women because an

unused or inactive uterus is particularly prone to have such benign growths present (42). Arthur Giles states "The uterus that could have become pregnant and has not done so is the one that pays the penalty" and the penalty is the development of fibromyomata and this results in the inability to conceive (39).

Retrodisplacement is not in itself a cause of sterility. It is interesting to note that in the work of the less well informed it is considered, and in those who do so much work along this line it is not given as an etiological factor.

Hostility of the Endocervical Secretions. - The problem of derangements in the cervical region is much debated. The authorities in the field feel that it is largely a mechanical role rather than chemical, bacterial or serological (43), (48). There, of course, may be the congenital factor of underdevelopment or block here, as in other locations in the genital system, but besides this, there may be inspissated plugs of mucous which are not dissolved by the lytic action of the semen, and thus there would be an impassible cervix (38), (23). During the normal cycle there are differences in the viscosity of the cervical contents and probably these changes are taking place at a time when ovulation occurs or when

lysis by the semen would be easier.

Causative factors which increase viscosity of the cervical contents are passive congestion, infection, poor drainage and a scanty precoital secretion.

Faults of Reception. - These are most often associated with ovarian hypoplasia which leads to or is the cause of other maldevelopmental conditions. Elongation of the cervix is one of the stigmata here, and accompanying this may be a pin hole os. This in itself is not a cause of sterility, but is simply one of the stigmata of a hypoplastic syndrome (42).

Anteflexion of the uterus may hide the cervical os against the anterior vaginal wall and as a result the spermatozoa do not have access to the cervical os. Descent of the uterus may let the cervical os be so far away from the seminal pool that the spermatozoa would have no chance to ascend the genital canal.

Study of the Problem of Sterility.

Usually the woman of the union concerned presents herself for study, and the partner considers himself free from trouble (1) because from Biblical times the male has not been considered in this problem. However, the study should not be undertaken until the physician

has an opportunity to consider the problem in the presence of both partners. He should not undertake the study until they are acquainted with the length of procedures involved, and unless there is an understanding that both parties will cooperate and complete the prescribed regime.

The problems concerned in a sterile mating are covered by a urologist, gynecologist and an endocrinologist, and these three usually constitute the team for the consideration of such a mating. Generally the cause of the defect is not some single abnormality, but rather the total of several factors. Complete diagnostic studies show that there are 4.79 factors in the average childless couple causing sterility. In only 30 per cent of the cases is there one major abnormality (43).

Since the male can be worked out more easily and more definitely than the female he is always studied first in any logical approach to this problem. The outline of the study varies with the various urologists, but should include a fairly complete history, examination of the genitals, examination of the semen, study of the secretions, and, according to some, an aspiration study of the testicles (43). However, the latter is contra-

indicated if there is a possibility of plastic surgery being done (25).

Male History, - Since the history may give a logical approach to further procedures this should be ascertained first and should be added to at any time that weak places are found in the study of the patient. Note the duration of the marriage and the use of contraception. Also the same with regard to past unions. Ascertain the frequency of coitus, spacing, desire, potency, and the husband's ideas towards his mate's feelings or reactions. Also find out about the hygiene of intercourse as there are from 3 to 5 per cent of couples who never have proper coital relations. Inquire about the postgenital infection by name, or in other words, be specific. Obtain specific information about epididymal infection in gonorrhoea. Other things to be noted are injuries to the testicles, mumps, exposure to X-rays, and previous investigation and treatment. The surgical history of the husband should be obtained with specific information about bilateral hydrocele, varicocele or hernia (35).

Examination of the Genitals. - Such an examination should determine any congenital malformation, scars of significance, discharge, stricture, varicocele and

hydrocele. A palpation of the testes may show thickenings of old inflammatory lesions. If palpation reveals the vas deferens as beaded then the chances are that the vas is occluded as this is the characteristic finding of occlusion. Abnormalities of the testes as failure of descent, hypoplasia, etc., should be noted.

A rectal examination will reveal any prostatic change to be picked up by palpation such as hypertrophy, inflammation and the presence of a tumor.

Study of the Semen. - The specimen for such a study may be obtained in two or three ways. It may be a friction specimen, withdrawal at the end of coitus and ejaculation into a wide-mouthed bottle, or a condom specimen (17). A count is done with a red cell pipette to determine the number of sperms in the ejaculate and the average count is 100,000,000 to 150,000,000. The average volume is 3 to 4 cc., and less than 0.5 cc. fails to provide an adequate seminal pool to insure fertility (31). The study should include a smear which is stained and the sperm heads evaluated (50). The smear may be done with a Gram stain if nothing better is at hand (31). A better stain can be obtained by the use of mercuric chloride, eosin and hematoxylin. This stains the nuclei blue and the cytoplasm red (11). The normal sperm head

is round with fairly sharp shoulders, a short body and a long tail (11). There have been more than 50 variants from the normal type described but these cannot be in excess of 19 to 20 per cent of the total number (31) (53). When there is 20 to 23 per cent abnormal sperms there is impaired fertility and a high incidence of fetal malformation and when 25 per cent of the sperm heads are variants from the normal there is clinical sterility (53). Abnormal sperm heads may be the cause of habitual abortion (47).

Lastly, the sperms should be examined periodically for a 24 hour period to determine the length of time that motility remains (31). A final statement should not be made from the study of one sample of semen, but should be on at least two samples, preferably samples taken after continence for a period of three days (31).

Study of Secretions. - Such procedures do not help a great deal, but they are mentioned. There is a substance in the semen which is supposedly an enzyme which causes a lysis of the endocervical contents (6). The absence of this would make it impossible for the spermatozoa to make their way through the cervix as there would be present a cervical block. The substance

is specific for the cervical mucous (38).

Aspiration of the testicle. - This may be done in absence of signs of inflammatory lesions either new or old. The aspirated contents may be studied the same as the ejaculate and in this way the procedure from the standpoint of endocrine therapy may be evaluated.

The Gynecological Investigation. - This study is usually carried out at a later date than the urological investigation of the male. This would be at the discretion of the investigators, and Meaker (43) carries on his study simultaneously with that of the male. The cooperating group meet biweekly to discuss the problems involved in the cases.

The gynecological investigator has to take a pertinent history, and perform a pelvic examination which would include a bimanual examination. Following this there would be special examinations as indicated such as tubal insufflation, examination of the vaginal pool following coitus and endocervical studies.

Female History. - The history should include the story that the wife has to tell about the sex life of the union. This would include frequency, spacing, libido, and post coital satisfaction. There should be inquiry

about operations, pelvic inflammation. Knowledge should be gained of the menstrual history, how it began, and at what age. This history should be taken with the woman alone so the facts will be obtained and not material which the wife wishes her husband to believe (17).

Abdomino-pelvic Examination. - First there should be a visual examination looking for abnormalities and congenital malformations. Note the introitus and whether there is a rigid or imperforate hymen (24) because in a few cases the urethra will dilate to form the sheath for the penis during coitus. Examine the clitoris and all external genitalia for signs of hypoplasia. The introitus should admit two fingers without pain (35). If there is pain and tenderness for no apparent reason it may be a sign of chronic passive congestion (35). The cervix generally lies against the posterior vaginal wall so on a digital examination note its position relative to the seminal pool for if it has no chance to contact the seminal pool it would be a factor (17),(6). Cervical polyps may be a cause of sterility in a small number of cases (18). In visualization of the cervix note the position of the cervical os as in a few patients the cervical os is eccentric, and in a few more patients

the cervical canal is not straight (5).

Palpation of the uterus should reveal any tumors or malformations. Submucous tumors are much more likely to be factors in sterility than interstitial or subserous, but any of them lower fertility. If the uterus is soft and boggy then there is a possibility of chronic passive congestion.

Next determine the status of the ovaries as to cysts, tumors, size and contour. Very often this is disappointing on the patients who tend toward obesity or some of those with endocrine disturbances. The ovaries are often irregular in outline in a sterile woman (3).

Study of the Secretions. - Formerly such studies were made of the secretions by putting a piece of litmus paper in the cervix. This was inaccurate and insufficient. The amount and viscosity of the cervical secretions should be noted (35). An increase in the viscosity is due to three things: (1) a pin hole os, (2) endocervical infection (43), and (3) chronic passive congestion. This causes the endocervical contents to be so thick that the sperms cannot penetrate the cervical canal (43).

Another type of study that may be made is to suck some of the cervical contents from the cervix post coital

and make smears and study viscosity and sperms. This may determine the lytic action of the semen on the endocervical contents and ability of the sperms to penetrate the mucous of the cervical canal (42). The cervical mucous probably varies at different times in the menstrual cycle as to its dissolution by the semen (52). The presence of living and apparently normal spermatozoa in the cervical canal after the seminal examination of the male has proven normal, absolves the male from blame (17). The degree of the vaginal acidity is often discussed as a cause of sterility but Moench does not think that this has anything to do with the problem.

The Huehner test may also be made. This is a study of the seminal pool following coitus made by pipetting the fluid from the vaginal vault (4). This should show a large number of squamous epithelial cells, some leucocytes, cellular debris, and active sperms. To determine the value of this examination the sperms are studied as to morphology, retention of motility, and length of time after intercourse the examination was made (17), (20). Because of cervical changes this test probably gives the best results when carried out between the 4th and 7th day after the cessation of the menstrual flow (55).

Study for Hypoplasia. - This is largely an endocrine problem but the gynecologist may aid the endocrinologist. This should be noted during the past examinations and includes an evaluation of the clitoris, the length of the cervix in relation to the uterus and other juvenile characteristics (6). Hypoplasia generally means ovarian underdevelopment (43) as well as a small vulva and vagina, a small and conical cervix with a pin hole os (3). In the majority of cases the recognition of hypoplastic genitalia in a person comes too late for the therapy to be of much avail.

Transuterine Insufflation with Gas (CO₂)-Rubin Test. The Rubin test is considered superfluous by some men who believe the use of lipiodol will tell much more. However, it is a test that a man can do without a lot of expensive apparatus, and it is a definite diagnostic aid (4). This test was given to the medical profession in 1920 (36).

It should not be attempted during any pelvic inflammatory process or for six months after, because of the danger of peritonitis and lighting up an old fire. Also, it should not be done during menstruation because of the danger of an air embolus in an open venous sinus (42).

The patient should present herself after a good

night's rest. A sterile speculum should be used and the cervix painted with iodine. Using sterile technique a cannula is inserted into the uterus with care so as not to penetrate the wall. The apparatus is connected with a mercury manometer so that the pressure may be measured. The first time the pressure is allowed to go to 150 mm. of Hg pressure, and if no change is noted withdraw the cannula, reinsert and allow the pressure to go to 200 mm. pressure (35). If the tubes are patent, and in the absence of spasm, the pressure will vary from a high to a low depending on the pressure exerted, following a curve like peristaltic action (17). At the conclusion the patient is allowed to sit up, and if she has a pain in the shoulder region, the gas is against the diaphragm. If there is no patency, then have the patient return in a couple of days and repeat the test giving 1/100 (33) or 1/150 gr. of atropine sulfate hypodermically. If spasm is complicating the picture this will be relieved by the anti-spasmodic, and if there is still no patency, there must be a block or occlusion (17). When there is a complete block the site of the pain is an index to the site of the occlusion. Uterotubal stricture will cause pain in the supra symphyseal region and if the blockade is at the fimbriated

end then the pain is lateral in the region of the anterior superior spine (62). In strictures or adhesions the gas may go through very slowly, but there is no rhythmical action as described above. In the absence of recording apparatus one may auscultate the abdomen and hear the gas escaping into the peritoneal cavity. There is in these cases a tendency for lipiodol to act as a foreign body and consequently would be contraindicated (62).

Study with Lipiodol. - This is the injection of an iodized oil into the uterine cavity and the observation of its action by X-ray following injection. Some chemical salpingitis cases have been reported, but there is now a 20 per cent acacia solution with a 40 per cent mono iodomethane sulfonate of sodium solution which gets away from the inflammation. The trade of this is Skiodan (67). This injection may be done fractionally or 10 to 12 cc. placed all at one time. Fractional injection gives a better differential diagnosis when injected 2 cc. at a time. By successive plates one may tell a uterine fibroid from an ovarian cyst as the progress of the radio-opaque substance is followed directly (33). If the patient complains of pain at any time the injection should cease and a film be taken. The patient should return in 24 hours for further films.

If the tubes are not visualized at all then, the obstruction is at the edge of the uterus. If the tube shows and the end is bulbous, then the obstruction is probably at the fimbriated end. If the lipiodol lies free in the peritoneal cavity then one or both tubes are patent. The advantage of this procedure is that it shows the exact place of a block and also gives some indications of whether there is some chance of success by operative interference (30).

The Medical Examination. - This should include a history with special emphasis on facts which may help the gynecologist. It should also include special reference to syphilis (4) and tuberculosis. Time should be spent in ascertaining the fruitfulness of various branches of the family. The internist may inquire into the childhood of both husband and wife, specifically about rickets, anemia and particularly about health at puberty. Details about the diet are needed as to quantity, character and amount of proteins (45) and calcium (6). The medical man should also know about work, sleep, relaxation and type and quantity of exercise. Both husband and wife should undergo a complete physical examination including physical measurements. The findings should be evaluated with those of the endocrinologist.

Routine laboratory work should be done because it has been found that 25 per cent of patients presenting themselves for sterility studies have blood counts below 4,000,000, and 10 per cent have white counts above 10,000. Both of these types should be investigated from the medical viewpoint (19). A routine urinalysis should be done also, as diabetes may account for a small percentage of these sterilities (42).

Endocrinological Investigation. - Dr. Havelock Ellis states "In the body lie great rivers of hormones which irrigate the human body and profoundly affect the flowering of the personality." (18). These hormones have a very profound effect on the presence of sterility in a fair percentage of cases. This branch of investigation has come forward very rapidly in the past 10 years, and now the presence or absence of endocrinopathy in each partner can be fairly well established or ruled out. Practically all of the endocrine glands have been indicated as a cause of sterility. In discussing these connections only a brief dissertation will be given.

It is suggested that in sterile women there is a lower threshold for excretion of the sex hormones than in normal women. Whether this is a cause or a result is not known (21).

The pituitary is considered the motor or controlling force (34) and liberates in the female two gonadotropic hormones which constitute the promoters of hormones in the ovary. Taking them in reference to the menstrual cycle, the first to be an activator is Prolan A which arises from the basophilic cells of the anterior pituitary. This acts on the resting and granulosa cells of the Graffian follicle producing maturation of the follicle. These cells in turn mature and the hormone estrin which is in the liquor folliculi exerts its action on the endometrium of the uterus. Here it causes a proliferation of the endometrium. Estrin has other effects, but they are not connected with sterility.

The pituitary produces another hormone later in the cycle which is known as Prolan B. This also comes from the basophilic cells of the anterior pituitary. Prolan B activates and causes to mature the granulosa cells of the Graffian follicle. These cells produce a hormone known as progesterin which takes up the maturation of the endometrium where the estrin leaves off, and completes the preparation for the fertilized ovum.

The anterior pituitary is responsible for producing a thyrotropic hormone or thyroid stimulating hormone probably from the eosinophilic cells. The action is

analogous to Prolan on the ovary. The thyroid is related to the ovary, but the relation is not clear. The thyroid probably fails most in sterility by changing the B.M.R. but no doubt other factors less well understood enter the picture.

A history should again be taken and here the family history should be taken carefully. One should ascertain however, whether the patients have a knowledge of the family as often there is little information concerning the ailments of the older generations. Thyroid disease is most often severe enough to attract attention, but pituitary and ovarian disturbances would be frequently overlooked by the lay observers. It is interesting to note that 17 per cent of the cases in a clinical study gave a family history indicating endocrinopathy. This was in patients having endocrine disturbances themselves (42).

The type of build, distribution of fat and changes in weight should receive consideration. Girdle obesity is indicative of pituitary disturbance. Underweight may be encountered in ovarian and thyroid disease.

The presence of an abnormal amount of hair or the male distribution of hair may show pituitary over-activity, and lack of hair may show pituitary under-activity. During adult life a sudden growth of hair in

the female over the face, legs and abdomen is indicative of ovarian failure.

Thyroid disturbance should be considered. A tachycardia may be an indication of hyperthyroidism and bradycardia is indicative of hypothyroidism. There may be no external change in the thyroid in so far as shape, size or contour is concerned (34). If there is a goitre present this may point to an endocrine disturbance, but only on the basis of probability (42).

There are many other factors which may be taken into consideration in evaluation of the endocrinological condition. There may be a bronzing of the skin indicative of adrenal pathology. There may be sugar in the urine in an absence of function of the Islands of Langerhans. Abnormal reflexes may show signs of tetany or failure of the parathyroids to function properly.

Lastly, but by no means of least importance, is a consideration of ovarian malfunction. While this may be due to the lack of gonadotropic hormone, it may be due to ovarian failure which is characterized by scanty periods or an amenorrhea. If there has been a failure at the age of puberty then there may be an accompanying genital hypoplasia also. The woman may be underweight in ovarian failure. A third thing of interest is the rhythm of the cycle. This gives some index of the ovarian

activity in so far as its regularity is concerned. There is usually a tendency to lengthen the period. In connection with the rhythm there should be a determination of ovulatory activity. The endometrium shows the presence or absence of follicular rupture (11), (60).

Laboratory work on these patients. - From the standpoint of expense to the patient this should be kept at a minimum, but there are some definite things which might be done if indications warrant. A B.M.R. may be run if there is some thought of pathology in the thyroid. From a clinical standpoint, a regulation of the thyroid will quite often regulate the ovarian function, the menstrual cycle, and thus correct sterility.

Meaker in his clinic evaluates the pituitary activity by use of the galactose tolerance test. Overactivity in the pituitary depresses the galactose tolerance to the point where an intake of 5 gm. will spill in the urine (44). Underactivity will increase the tolerance to the point where from 100 to 200 gms. may be ingested and there be no urinary findings.

Perhaps the simplest test that may be done for information about ovarian failure is curettage of the uterus. This may be done at about the 15th day of the cycle and again just before the period starts. At the

time when ovulation occurs a curettage should show some endometrial growth and change. Premenstrual curettage should show growth of goblet cells and definite preparation for the fertilized ovum. The absence of these findings would be indicative of ovarian change. Curettage is condemned by some men who have said there is danger of introducing infection, rupture of the uterus and damage to the cervix.

If ovarian function is to be placed on a more definite basis the hormones may be isolated and assayed for presence and strength from both the urine and the blood.

Estrin may be extracted from the urine by ethyl acetate then distilled in propylene glycol and injected into ovariectomized rats for assay. The presence of cornified cells in the vagina of the rat indicates the presence of the hormone and the amount of the assay necessary to produce the cornification can put the assay on a definite basis.

Estrin in blood is assayed by the Fluhmann method. This is taking the blood serum and injecting it into ovariectomized mice. The vaginal reaction in this case gives an indication of the presence of the hormone. By injecting several mice the average reaction will determine the assay.

The most common method of extraction and assay of estrin in the blood is the Frank-Goldberger test. Forty cc. of blood is taken and mixed with sodium sulfate. This is dried and then extracted with ether twice and evaporated. The precipitate is emulsified in distilled water and this is then divided into three portions. A female mouse which has been castrated for at least two weeks is taken and each portion is injected at four hour intervals. Vaginal smears are made 12 hours after the last injection and at 12 hour periods thereafter for three additional times. A final smear is taken on the morning of the third day.

Results are read by the reactions of the vaginal epithelium. If all the epithelial cells are flat and nucleated it is considered a strong positive reaction. If there is a mixture of nucleated and non-nucleated cells it is a regular positive reaction. The presence of nucleated cells only is a weak positive reaction. When there are nucleated cells with leucocytes and mucous present the reaction is very weak positive. Finally if there is an occasional nucleated epithelial cell with a preponderance of leucocytes and mucous the reaction is considered negative (69).

Corpus luteum is assayed by injecting an extract into

immature female rabbit on five successive days. At the end of this time the animal is sacrificed and a study made of the endometrium. If there are changes so the endometrium is in a condition similar to the 8th day of a normal pregnancy the hormone is present.

A study of the gonadotropic hormones may be made in a similar way. Zondek's method for Prolan A is to take the morning urine and extract with ethyl alcohol and then with ethyl ether. Dry the substance and redissolve in distilled water and this takes up the estrogenic hormone (37). Following extraction, assay of the hormone may be accomplished by injection into female mice. These should be immature and weigh six to eight grams. The mice receive 0.25 cc. of the extract twice daily on three successive days. They are sacrificed at the end of 100 hours and the macroscopic presence of large, reddened ovaries showing large follicles and an enlarged and extended uterus with an open vagina is a positive test. By diluting the extract and injecting in successive trios of mice it is possible to establish a mouse unit fairly close and a mouse unit is approximately the same as an international unit (37).

Prolan A may be assayed from blood by the Fluhmann method which is the injection of blood serum

into immature mice. Again follicle formation, leut-
inization and the hemorrhagic cyst reaction are the
diagnostic points, but this determination is made by
a microscopic study of the ovaries (37).

Zondek was responsible for a method for extract-
ing Prolan B. He found that this could be taken up in
water. Following the extraction it may be injected into
immature female mice weighing six to eight grams. A
total of 6 injections are given subcutaneously in 100
hours. A positive test for the presence of the hormone
is the presence of corpora lutea (37).

The above are the important female sex hormones
which might be studied in connection with sterility.
The laboratory procedures given are on the whole too
expensive for the average patient. In order to complete
the study the male sex hormones should be extracted
and evaluated (37).

The method of Callow is used in extracting the
male sex hormone from urine. This consists of extract-
ing with benzene and then evaporating and reextracting
the residue with redistilled ether. This is filtered,
evaporated and then redissolved in arachis oil. The
oil is injected into caponized roosters. The response
of the capon in developing secondary sexual character-
istics is the determining factor for the presence of

the hormone. There is a system whereby measuring the comb growth gives an index to the amount of hormone present (37).

The Kleimer test is also used where the extracted substance is placed in a fish bowl of a given size containing bitterling fish. The study is made on the length of the oviposter. Smallest amount of extract causing a response would be one bitterling unit (37).

In the final analysis the appearance of the patients will be the guide that is used along with the simpler and less expensive laboratory tests in the majority of cases.

Treatment.

Treatment is widely discussed and differs just as widely. This will be discussed in the same sequence as the etiology was approached. Since in the course of events the male was studied first, we will take up the treatment of that partner first. The treatment usually consists of treating both partners at the same time as they commonly are both at fault.

Deficient Spermatogenesis. - The causes of deficient spermatogenesis are several as already mentioned. First there is a deficiency due to actual disease of the testes which might be orchitis due to mumps, gumma of the testes and occasionally trauma. Secondly, there is an undescend-

ed testicle or testicles, known as a cryptorchism. Lastly, there is a deficiency due to constitutional reasons, and to an endocrinopathy.

When there has been a bilateral orchitis due to mumps, the chances are that there is little that can be done in the way of therapy. However, anterior pituitary-like substance was given to a man with an aspermia following a bilateral orchitis from mumps, and he developed sperms in twelve weeks. Two cc. of the extract from pregnancy urine was given as the dosage every other day to bring about the response. The sperms disappeared as the treatment was discontinued (8).

If a few sperms are found, hormonal treatment may also be tried, but if there is no response, the treatment should not be condemned. However, where actual destruction of the testes can be elicited by history or examination, the case in so far as therapy is concerned is hopeless.

With a deficiency of spermatozoa in semen due to one testis undescended or both not in the scrotal sac there is usually little hope for results in the married man. These should have attention previous to puberty when by operative procedure they can be brought down into the scrotum. Some attempts have been made to cause descent by the administration of Antuitrin S

(100 rat units weekly), but this is not a positive way such as operation is, and yet a few cases respond to this therapy. Following descent by either of these methods, the use of Antuitrin S is indicated. The dosage is quite variable with different men discussing this, but they do agree on the point that it should be adequate. It should be at least 100 rat units weekly, and the treatment should be continued for at least 6 months (40). Thyroid and pancreatic hormones stimulate the testes to growth but this is probably exerted through the pituitary (10).

The treatment of constitutional disorders is discussed adequately by several authors, and many suggestions are made. The husband should have his sexual habits corrected if they are devitalizing. He should be warned against the excessive use of alcohol (61). The diet should be high in protein, rich in vitamins A, B and E (10), (27), (41), of which vitamin E gives the best results (48). Calcium lactate is also indicated in some cases (2). There should be a definite regime of exercise and rest given the patients. There should be exercise enough so that the food will be assimilated, and there must be rest sufficient to build the body to a place so it is as efficient as possible. There should also be plenty of fresh air. The whole of the foregoing

can be summed up by saying that there should be a well rounded active existence with moderation in practically all things.

Endocrinological treatment is much condemned by some, but perhaps this is because these men treat an endocrinopathy which does not exist (42). Better results are obtained by adequate treatment of one gland because usually there is "uniglandular cause of a polyglandular syndrome" (7). If by use of the methods given under laboratory examination an endocrinopathy is established, then treatment should be instituted to correct the fault. It has been noted by some students of sterility that practically all males with deficient spermatogenesis have a lowered basal metabolic rate (48). In some patients the basal metabolic rate is only slightly lowered but this is regarded as having significance. These patients should all have thyroid. It should be given about $\frac{1}{2}$ gr. T.I.D. until the desired effect is obtained. It is surprising in patients with a slightly lowered basal rate to note the amount of thyroid they will tolerate with little or no therapeutic effect. The above dosage may be increased or decreased as desired.

If endocrinopathy of the anterior pituitary is established and a large bulk of male dysfunction is due

to this (39), then Antuitrin S (P.D. & Co.) is given. The dosage differs but it has been suggested that 100 rat units every other day be given (40). The treatment should be continued for from six months to a year in order to properly evaluate it. This causes tubular response which results in an increased number of sperms, an increase in the motility of those found in the semen, and a longer duration of the motility. Often the response is only for the duration of the treatment. Aspermia may be treated with anterior pituitary-like substance but the response if obtained is temporary (8).

Obstruction and Occlusion of the Ducts. - This condition is encountered in 5 per cent of the cases of male sterility (6), although it is a debatable point as it is given by some as the most frequent cause of sterility in the male (26). The result is an azoospermia as the sperms are retained in the epididymis.

If there is just cause to believe that spermatogenesis is normal in every respect, the only hope of doing away with such a condition is by surgical anastomosis of the globus major on the testes to a patent portion of the vas deferens. There are two conditions necessary for curing such sterility or for the success of such an operative procedure. First the vas deferens must be

patent above the anastomosis, and second the globus portion of the epididymis must contain live sperms. The first condition may be evaluated by a lack of beading along the vas and the second by a full feeling in the epididymis. If the epididymis is not palpable at all then it may be entirely obliterated by fibrous tissue.(26). Rectal palpation determines whether there is any infiltration around the ampulla of the vas (25).

The operative procedure consists of a lateral anastomosis of the patent vas and globus major. There have been no successful cases reported unless silver wire has been used for suture material (25). This seems to set up less tissue reaction and too much scar tissue dooms this operation. In the first operation the anastomosis is made as low down as possible, because in the presence of failure future anastomoses may be done. Hagner has made as many as three anastomoses before obtaining success (26).

If there is a patent duct on one side and a globus major with sperms in it on the opposite side a cross anastomosis may be done, but the percentage of failure in this operation is much higher (26). General anesthesia should be used in this operation as local infil-

tration is a contributing factor for more scar tissue formation.

Urethral strictures which are tight enough to interfere with ejaculation call for a gradual dilation with sounds, or in the more aggravated cases for urethrotomy (42).

Hostility of secretions. - The mucous of the prostate and seminal vesicles is frequently antagonistic to the sperms. This may be due to an inflammation of the non-gonorrheal variety. The first step in the treatment of such cases is to erradicate all possible sources of focal infection in the body. This would include teeth, tonsils, gall bladder, appendix, etc. Attention to the general hygiene of the body should be given. Sexual activity should be restricted, although moderate exercise of the sexual powers would promote drainage which has some advantages.

Local therapy consists principally of massage and irrigation. The value of massage is twofold in that it promotes drainage and also an active hyperemia which aids in increasing local resistance (42), (61). Heat as an aid to massage is also useful in healing an infected prostate gland (17).

Faults of Delivery. - These may vary in many ways.

In the first place there must be intercourse with enough frequency to allow a chance for union of the gametes.

Congenital faults as epispadias and hypospadias may be corrected by surgery. These corrections should be carried out before puberty. Often these plastic operations have to be done in several stages and for this reason greater cooperation is usually had in the younger person. The procedure that is commonly followed is to take all the available loose skin to form a new urethra.

The suggestion has been made by good authority that when the male has faults of delivery or the female has faults of reception on a similar basis, these faults may be overcome by wearing a condom with a hole cut in it so the sperms are directed toward the cervical os (66). Pre coital secretions are necessary and perhaps more husbands should receive instructions as to the physiology of intercourse (39).

If all means fail, then the semen of the husband may be collected and artificial insemination attempted (14), (42). This should only be attempted as a last resort (4).

Treatment of the Female. - Deficient Oogenesis.

Established genital hypoplasia in the adult woman is not directly curable by any method/^{of}treatment available at the present time. The treatment of the simple type of deficiency is largely constitutional including both endocrine and non-endocrine measures.

When the etiology of deficient oogenesis was discussed, the importance of chronic passive congestion as a cause was mentioned. In order to relieve this condition it may be necessary to resort to surgery. If the ovaries are prolapsed into the pelvis the utero-ovarian ligaments need to be shortened and perhaps a ventral suspension of the uterus may aid in relieving congestion (28), (41). The eradication of foci of infections is also necessary because they are common causes of passive congestion. Cysts and benign tumors may be a cause of impaired oogenesis (41). In cases where the problem of sterility is involved the principle is to remove the abnormal tissue with the idea of preserving as much normal tissue as it is possible to preserve with the least amount of trauma. Most surgery must be looked on with askance because the procedures seldom come up to expectation, although in cases where there is a thickened capsule surgery alone offers relief (28).

Constitutional inferiority must be corrected before the ovaries may function correctly. This includes the eradication of foci of infections such as para nasal sinuses, tonsils and teeth which call for attention.

Syphilis must be corrected by the anti-luetic remedies (23). Drug poisoning must be eliminated including lead and morphine. Alcohol must be restricted although need not be completely eliminated.

Proper diet must be assured and it is better to lay out a definite regime for the woman. There must be an abundance of nitrogen, vitamins and mineral salts (6), (59). Among the articles regarded as beneficial are meat, milk, eggs, butter, whole cereal, leafy vegetables and citrus fruits (14). Psychic factors should also be corrected and they are of particular importance in the female (59).

States of general debility ought to be treated with the idea of improving the general health and thus hope that fertility will be raised. Anemia should be corrected and 25 per cent of the patients have blood counts under 4,000,000, so this includes a fair percentage of the sterile patients (19).

Obstruction at the ovariotubal Hiatus. - Even

though the physiology of the passage of the ovum across this gap is not well understood, there are two obvious derangements that are amenable to treatment. The first of these is the correction of periovarian or peritubal adhesion and peritonealizing in so far as possible. Secondly, the ovaries may be brought closer to the fimbriated tubal opening by shortening of the uteroovarian ligaments.

Obstruction and Occlusion of the Ducts. - The first step in the treatment of this condition is the removal of any factor which is causing congestion in this region. This may be done by correcting the uterine position with a pessary and if necessary the use of operative intervention.

Transuterine insufflation with gas while mentioned before as a diagnostic aid very definitely is of therapeutic value (1). Rubin has reported pregnancy following in about 10 per cent of his insufflation examinations. The test may be carried out two or three times twice a month before the tubes open and a pregnancy results (35). Reports of similar nature have followed from the use of iodized oil, and when one fails the other may work. The mechanism may involve the removal of a cervical plug, the straightening out of kinks, breaking of light

adhesions or the separation of adherent mucous surface.

Surgical procedures which may be performed in sterility are successful in 8 per cent (18) in one series of cases. There are three types of reparative procedures that may be followed depending upon the site of the block. If the block is at the uterine end of the tube the tube may be resected from the uterus. A reamer is used to curette a new opening into the uterus and then reimplant the patent tube in the uterine wall. The patency may be tested by blowing air through the Fallopian tubes. These operations are sometimes followed by pregnancy in three months if the procedures are successful (17).

If the block is at the fimbriated end of the tube the fimbriations may be circumcised (64). One must then be sure of patency by blowing air through the tubes. After establishing this fact the lumen of the tube is everted at the end to establish a new opening and stitched down around the tube (17).

In cases where the tubes are blocked along their entire length, the Estes operation may be done as a last resort (64). This consists of implanting the ovary in the uterine wall with some of the ovarian tissue next to the uterine cavity and hoping that follicle rupture will take place when there are sperms present to fertilize

the egg, and that implantation will also take place. This is very rarely successful(17).

One might also think that the use of anti-spasmodic drugs would be of much value, but actually they do not produce results (42). Atropine or benzylbenzoate before coitus are advised and perhaps should be tried even after the previous idea is expressed.(13).

Uterine Blockade. - From the standpoint of correcting sterility about the only treatment available which gives some degree of success is the removal of obstructive fibro myomata (39). These are followed by a fair percentage of pregnancies even though they appear hopeless. While uterine hypoplasia has been treated on a blockade basis, these have been universally attended by failure.

Hostility of Endocervical Secretions. - This hostility is usually due to poor drainage, infection, chronic passive congestion, scanty precoital secretion of mucous.

The poor cervical drainage may be corrected by enlargement of the cervical opening. This may be done by removal of a wedge-shaped section from the cervix, or even temporarily by dilatation (42). Dilatation may be repeated in cases where hospitalization for a

few days is impracticable. The dilatation should be continued until a # 14 Hegar dilator can be passed (5), but this practice is not universally accepted (14).

Infection of the cervix should be treated to clear up any local passive congestion or infection. Simple diathermy may improve the local circulation. In average cases of endocervicitis linear cauterization is used (4). This must be carried out so that infection high in the cervix will be taken care of. The criticism is made that too much cauterization is done on an insufficient pathological basis. It would seem that in these patients there is an excellent chance of a chronic prostatic infection in the mate, and if found, both infections should be treated simultaneously.

Chronic passive congestion causes an increase in cervical secretions and greater viscosity of the secretions (35). Scanty precoital secretion may be normalized by instructing especially the male in the proper technique of intercourse. A surprising number of otherwise intelligent and thoughtful husbands are ignorant about sex physiology (42). There should be an excitatory period prior to the act of coitus and the final result should be an orgasm which would relieve passive congestion in the region.

Faults of Reception. - Any anatomical defects must be obliterated and often this may be done surgically. If there is a vulvar tumor or painful hymeneal tags or remnants these may be excised, and in some cases treated later with local heat and massage.

Fissures or ulcerations either traumatic or on an infectious basis should be freshened and treated with boracic acid ointment. While healing is taking place there should be a period of sexual rest.

True vaginismus is a difficult and obstinate problem (46), (24). Psychotherapy must be applied and the patient instructed to contract the muscles of the abdomen, or in general the antagonistic muscles, which relaxes the muscles of the introitus and thus the muscles causing pain. Cocaine ointment applied previous to coitus is used to get the desired relaxation (46).

Anteflexion of the cervix should be treated by plastic surgery. By this means the anterior cervical attachments are lengthened which allows the cervix to fall back closer to the seminal pool in the vagina.

Endocrine Treatment in the Female. - Since there are three major endocrine dysfunctions in sterility, we will take up the treatment of these deficiencies in connection with a failure of each gland in itself.

The anterior pituitary is the master gland and is reciprocally affected by the others. The secretory substances produced are two in number, but the material available for treatment is made up to overcome a deficiency for both, consequently it is all that is given. This contains both Prolan A and Prolan B of the anterior lobe, or in other words, both gonadotropic hormones (63). Antuitrin S put out by Parke Davis and Co., is the usual preparation given. This is given after the close of the menstrual period, usually starting out with 50 international units, and if there is no reaction then the dosage may be doubled. Usually about 1000 units is given and then stopped until the next menstrual period when the therapy can again be tried. The success of this treatment depends on the ability of the body to respond, but also largely on the persistence of the therapist (11), (34).

Another method of treatment which is recommended but perhaps gets away from the therapeutic principle of treating only one gland, is the administration of 3 cc. of anterior pituitary-like substance hypodermically, and 100 rat units of anterior pituitary extract given on alternate days. The results of both methods are disappointing (7), (39).

Stimulating doses of X-ray to the pituitary gland have also been followed by favorable results (29), (57). The dosage advised is from 50 to 80 roentgen units each week for 6 weeks to the region of the sella turcica.

The ovary is the next gland to discuss from the endocrine viewpoint. We have already mentioned that the endometrium is the registering board of ovarian function (58) and is the guide to treatment. So closely allied are the menstrual disturbances to the failure to conceive that efforts to regulate the periods and to bring about conception go hand in hand (7).

This treatment is perhaps the least productive of all in so far as results are concerned as it should be given during puberty, but in order that nothing be left undone one should try it. Theelin which is the secretory product of the follicle cells is administered hypodermically on the 1st, 4th, 7th, 11th and 16th days of the cycle. The dosage is 2000 international units at each administration. This is early in the cycle and should prepare the ovary for rupture. When treatment is first initiated and there is an anovulatory menstrual cycle as shown by endometrial studies, one rabbit unit of prolutin may be given from the 18th day

for 5 successive days to stimulate menstruation, but later discontinued as progestin forms. In hypoplasia with no upset in the menstrual function one might try 1000 rat units of theelin biweekly, with the idea of stimulation and thus get some response (4). Irradiation of the ovaries is mentioned (7) giving 50 to 80 roentgen units but this is condemned by others because the ovaries vary as to their susceptibility to X-ray.

Finally the treatment of the thyroid gland. This is done routinely by some men in treating dysfunction of the endocrine system. Desiccated tissue is given per os and from $1\frac{1}{2}$ to 2 grs. daily until the therapeutic effect of flushing, sweating, and hyperactivity is obtained. This seems to speed up the whole endocrine system as well as the rest of the body (7).

Other attempts to regulate the endocrine mechanism have met with failure but maybe tried as the adrenals and the Islands of Langerhans. However, these are almost universally without result.

Prognosis.

The results obtained from the treatment of sterile mating vary with the clinic and the way that statistics are kept. Generally speaking, the prognosis in an ovarian

endocrinopathy is poor, in anterior pituitary failure it is poor, and in thyroid dysfunction it is brilliant.

Obstruction and occlusion of the male genital ducts respond in about 10 per cent of the cases although there is a wide variation. Hostility of the prostatic-vescicular secretions can nearly always be corrected (42).

Faults of delivery and reception are quite variable in their response to cure. If the faults are psychic they may not respond, and if anatomical they can usually be eliminated.

Hostility of the endocervical secretions usually respond to treatment in from 25 to 30 per cent of the sterility cases. Uterine blockade is relieved by myomectomy in from 10 to 20 per cent of the cases.

Tubal obstruction and occlusion usually has a variable prognosis. One author states that generally he had a thirty per cent response in his clinical series and 50 per cent response in his private cases (64). Others state the results as much less as only a 15 per cent response (42). Isthmus obstruction is seldom relieved and 20 per cent of the obstructions at the fimbriated end give good results in an English series (22). Post operative salpingograms aid in the results of the operative procedures.

The prognosis of the field as a whole is rather

difficult to state, but is probably between 15 and 25 per cent successful although some claim as high as 35 per cent (39). If the Fallopian tubes are patent in the female and the male shows some degree of fertility Bland and First hold out a hope of 50 per cent cure (6).

Prevention of Sterility.

This is a many sided program which no doubt in the future will involve the sociologist, the teacher and may extend into the field of economics.

First, any genital hypoplasia must be corrected early, either before puberty, at that time, or very soon after (35), (7). This means that education must play a part as well as closer contact between patient and legitimate medicine.

Any disease either acute or chronic which comes at the time of puberty should be well taken care of as it may be a factor in sterility (9).

Sex hygiene must be studied and must become a part of our educational program (35). Premarital contacts with an adequately trained physician and everything done to prevent sexual maladjustment at a later date. Following marriage all factors which promote domestic infelicity should be eliminated to promulgate the best sexual adjustments.

Venereal disease as a cause of sterility is a factor that is much debated. To prevent this as a cause of sterility requires the cooperation of educators, legal, governmental, and social agencies and of the medical profession.

Education of the public so the sterile couple will seek help without prolonged delay will be a distinct aid to the physician in prevention (44). "Hope should never be taken away from a sterile woman because though all measures fail we should remember that glandular dyscrasias are somewhat subject to natural change, and time may do for one patient what we have failed to accomplish" (2), (20).

BIBLIOGRAPHY

1. Abbott, W. F., "Sterility in the Female" Canadian Medical Association Journal 30: pp. 399-402 April 1934.
2. Anspach, Brooke M., "Observations on the Results Obtained in the Treatment of Sterility" American Journal of Obstetrics and Gynecology 19:pp. 1-15 January 1930.
3. Anspach, Brooke M., "Diagnosis and Treatment of Sterility in Women". The Pennsylvania Medical Journal 37: pp. 214-219 December 1933.
4. Bickers, William, "Sterility in the Female". Virginia Medical Monthly 64: pp. 214-216 July 1937
5. Birnberg, Chas. H., "A Phase of Sterility". Journal of the American Medical Association 103: pp. 1143-1144 October 13, 1934.
6. Bland, P. Brooke and First, Arthur, "Sterility" Medical Clinic of North America 20:pp. 61-73 July 1936.
7. Bland, P. Brooke, First, Arthur and Goldstein, Leo, "The Clinical Investigation of Functional Sterility" Journal of the American Medical Association 105:pp. 1231-1237 October 19, 1935.
8. Brosius, Wm. L and Schaffer, Robt. L., "Spermatogenesis Following Therapy with the Gonad Stimulating Extract from the Urine of Pregnancy" Journal of the American Medical Association 101: pp. 1227- October 14, 1933.
9. Cary, W. H., "A Clinical Study of One Hundred Cases of Developmental and Functional Deficiencies in the Female with Analysis of Treatment and Results" American Journal of Obstetrics and Gynecology 25:pp. 335-350 March 1933
10. Charny, Chas. W., "A Clinical Study of Male Sterility" Journal of Urology 32: pp. 217-230 August 1934.
11. Chute, Richard, "Endocrine Factors in Sterility" Journal of the American Medical Association 107: pp. 1855-1859 December 5, 1936.
12. Clark, J.D., "Sterility in the Female" The Journal of the Kansas Medical Society 34: pp. 207-212
13. Cohen, Joseph, "Sterility" New Orleans Medical and Surgical Journal 83: pp. 401-405 December 1930.

BIBLIOGRAPHY (cont)

14. Dabney, M.Y. and Dabney, Eugenia, "Sterility in Women" *New Orleans Medical and Surgical Journal* 85: pp. 227-234 October 1932.
15. Dierker, Bernard J., "The Management of Cases of Apparent Sterility" *Journal of the Iowa State Medical Society* 25: pp. 304-307 June 1935.
16. D'Oronzio, Joseph B., "Male Sterility and the New Remedies" *The Urologic and Cutaneous Review* 41: pp. 247-250 April 1937.
17. Falk, Henry C., "Sterility" *American Journal of Surgery* 39: pp. 151-188 July 1937.
18. Ferguson, Robt. Thrift, "A Review of Five Hundred Cases of Sterility in Women from the Functional, the Endocrinal and the Organic Viewpoint" *Southern Medicine and Surgery* 98: pp. 259-263 May 1936.
19. Ferguson, Robt. Thrift, "Tubal Patency Test" *Southern Medical Journal* 95: pp. 429-431 August 1933.
20. Field, Marshall, "Management of Sterility in General Practice" *Illinois Medical Journal* 65: pp. 543-545 June 1934.
21. Frank, Robt. T., and Goldberger, Morris A., "Utilization of the Hormone in the Normal Woman: Effect of Abnormal Kidney Permeability in the Production of Amenorrhoea and Sterility" *Journal of the American Medical Association* 94: pp. 1197-1199 April 19, 1930.
22. Green-Armytage, U.B., "Sterile Mating" *Lancet* 2: pp. 426-427 August 22, 1936.
23. Green, Bradford, "Modern Treatment of Human Infertility" *The Pennsylvania Medical Journal* 39: pp. 576-579 May 1936.
24. Gibbons, R. A., "Sterility in the Female" *Practitioner* 132: pp. 336-347 March 1934.
25. Hagner, Francis R., "Sterility in the Male" *Surgery, Gynecology, and Obstetrics* 52: pp. 330-335 February 1931.
26. Hagner, Francis R., "The Operative Treatment of Sterility in the Male" *Journal of the American Medical Association* 107: pp. 1851-1855 December 5, 1936

BIBLIOGRAPHY (cont)

27. Hance, Brutis M., "Sterility" The Urologic and Cutaneous Review 41: pp. 643-647 September 1937.
28. Hibbitt, Chas. W., "Sterility in the Female" Kentucky Medical Journal 34: pp. 328-331 August 1936
29. Hirst, Barton Cooke, "The Four Major Problems in Gynecology" Journal of the American Medical Association 101: pp. 899 September 16, 1933.
30. Holland, Eardley, "On Infertile Marriage" The Practitioner 132: pp. 305-312 March 1934.
31. Hotchkiss, Robert S., "Methods in Sperm Analysis and Evaluation of Therapeutic Procedures" Journal of the American Medical Association 107: pp. 1849-1851 December 5, 1936.
32. Hurst, Arthur F., "Sterility and Psychoneuroses Following Lumbar Sympathectomy" Lancet 1: pp. 805-806 April 6, 1935.
33. Hyanus, Mortimer N., "Uterosalphingography by Interrupted Fractional Injections" Surgery, Gynecology and Obstetrics 60: pp. 224-228 February 1935.
34. Johnson, W.O., "Sterility from the Viewpoint of the Endocrinologist" Kentucky Medical Journal 34: pp. 331-336 August 1936.
35. Kleegman, Sophia J., "Sterility" American Journal of Surgery 33: pp. 392-405 September 1936.
36. Kliman, Frank E., "Office Management of Sterility Cases" Minnesota Medicine 16: pp. 134-137 February 1933.
37. Kurzrok, Raphael, "The Endocrines in Obstetrics and Gynecology" William and Wilkins Co., Baltimore 1937.
38. Kurzrok, Raphael and Miller, Edgar G., "Biochemical Studies of Human Semen and Its Relation to Mucous of the Cervix Uteri" American Journal of Obstetrics and Gynecology 15: pp. 56-72 January 1928.
39. Lane-Roberts, C.S., "The Treatment of Sterility" Transactions of the Medical Society of London 59: pp. 115-135 September 1936.
40. Lloyd, V.E., "Gonadotropic Hormones in the Treatment of Sterility in Man" Lancet 1: pp. 474-475 February 29, 1936.

BIBLIOGRAPHY (cont)

41. Macomber, Donald, "Ovarian Deficiency As a Cause of Sterility" American Journal of Obstetrics and Gynecology 19: pp. 739-747 June 1930
42. Meaker, Samuel R., "Human Sterility" William and Wilkins Co., Baltimore 1934
43. Meaker, Samuel R., "The Gynecologic Aspect of Human Sterility" Journal of the American Medical Association 107: pp. 1847-1849 December 5, 1936.
44. Meaker, Samuel R., "The Modern Approach to the Problem of Human Sterility" Practitioner 132: pp. 326-335 March 1934
45. Meaker, Samuel R., "A Survey of Causative Factors in Sterility" American Journal of Obstetrics and Gynecology 20: pp. 749-759 December 1930
46. Meurlin, Alfred "Infertility in Women" Journal of the Medical Society of New Jersey 34: pp. 455-457 July 1937
47. Moench, G. L., "A Consideration of Some of the Aspects of Sterility" American Journal of Obstetrics and Gynecology 13: pp. 334-345 March 1927
48. Moench, G.L., "A Consideration of Some of the Aspects of Sterility" American Journal of Obstetrics and Gynecology 32: pp. 406-415 September 1936
49. Moench, G.L., "A Consideration of Some of the So-called Obscure Causes of Sterility" Journal of the American Medical Association 94: pp. 1204-1207 April 19, 1930
50. Moench, G.L., "Biometric Studies of Head Lengths of Human Spermatozoa" Journal of Laboratory and Clinical Medicine 17: pp. 297-310 January 1932
51. Moench, G.L., "Do Sperm Morphology and Biometrics Really Offer a Reliable Index to Fertility?" American Journal of Obstetrics and Gynecology 25: pp. 410-411
52. Moench, G.L., "Solubility of Cervical Mucous in Relation to Menstrual Cycle" The Journal of Laboratory and Clinical Medicine 19: pp. 358-361 December 1933
53. Moench, G.L. and Holt, Helen "Sperm Morphology in Relation to Fertility" American Journal of Obstetrics and Gynecology 22: pp. 199-210 August 1931

BIBLIOGRAPHY (cont)

54. Moorman, Chapman S., "Sterility in the Male" Kentucky Medical Journal 34: pp. 324-328 August 1936
55. Morgan, Harold S., "The Investigation of Sterility" The Nebraska State Medical Journal 17: pp. 386-388 September 1932
56. Newell, Quitman, U., "Some Recent Advancement in the Management of Sterility Cases" Texas State Medical Journal 30: pp. 23-26 May 1934
57. Novak, Emil, "Endocrine Aspects of Sterility" Practitioner 132: pp. 313-325 March 1934
58. Novak, Emil, "Endocrine Mechanisms in Certain Functional Gynecological Disorders" Surgery, Gynecology and Obstetrics 60: pp. 330-340 February 1935
59. Novak, Emil, "The Uses and Abuses of Modern Gland Products in Gynecological Disorders" Journal of the American Medical Association 105: pp. 662-667 August 31, 1935.
60. Novak, Emil, "Two Important Biologic Factors in Fertility and Sterility" Journal of the American Medical Association 102: pp. 452-454 February 10, 1934
61. Read, J. Sturdivant, "Sterility in the Male" Journal of Urology 31: pp. 411-417 March 1934
62. Rubin, I. C., "The Diagnosis of Peritubal Adhesions and Tubal Stricture by Utero-tubal Insufflation" American Journal of Obstetrics and Gynecology 24: pp. 729-743 November 1932.
63. Schneider, Phillip F., "A Syndrome Suggestive of Estrogenic Deficiency" American Journal of Obstetrics and Gynecology 31: pp. 782-790 May 1936.
64. Sovak, Francis W., "Operative Treatment of Sterility" American Journal of Surgery 33: pp. 406-421 September 1936.
65. Titus, Paul, "Human Sterility" Southern Medical Journal 30: pp. 410-418 April 1937

BIBLIOGRAPHY (cont)

66. Titus, Paul, "Sterility" Journal of the American Medical Association 105: pp. 1237-1240 October 1935.
67. Titus, Paul, Tafel, R.E., McClellan, R.H., Messer, F.C., "A New Non-Irritating Opaque Medium for Utero-Salpingography" American Journal of Obstetrics and Gynecology" 33: pp. 164 January 1937
68. Wimsco, James P., "Sterility in the Male" American Medicine 39: pp. 411-413 September 1933.
69. Wolf, William, "Endocrinology in Modern Practise" W.B. Saunders and Co., 1937 Philadelphia pp. 602-605; 948-949.