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A Ninth Grade Teaching Unit on Human Embryology

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Unit Topic: Human Embryology

A Short History

Perhaps the first paper written on the topic of embryology was by Aristotle (384-322 B.C.). He observed the development of chicken eggs very closely and based his theories of embryonic growth on these observations. He theorized that embryonic development could occur in two ways: preformation or epigenesis.

The Preformation Theory . This theory postulated that each female egg contained a miniature human being (homunculus). According to this theory, all that would have to happen was for the male's seed to unite with the female's egg to start the development of this miniature person. For a long period of time many prominent people subscribed to this theory and some went as far as to figure out how many preformed humans were carried by Eve (200 million). They claimed that after all of these preformed people were developed, our race would end. [1]

The Epigenesis Theory . According to this theory Aristotle believed that the young organism developed from a formless mass of living material. He postulated that development of this mass into a human being would occur by differentiation of cells into various body parts. We see a degree of proof of this differentiation by studying the three layers of zygote (ectoderm, mesoderm, and endoderm).

In the late nineteenth century two men, Wilhelm Roux (1850-1924) and Hans Driesch (1867-1941) formulated their own theories of embryonic development. Roux's experiments were designed to prove that a modified theory of preformation was correct. In his Mosaic Theory of embryonic development he claimed that if there is a preformed pattern within the fertilized egg, then one cell remaining alive would form only one part of an embryo. Roux went on to kill one cell and only developed half embryos out of the remaining cells.

Meanwhile, Driesch set out to disprove the Mosaic Theory of preformation and put forth his own theory of preformation. His experiments were done on sea urchins, unlike Roux he did not kill any cells, he merely removed one cell and developed it. Both of the remaining cells developed into complete sea urchins, as a matter of fact in sea urchins it has been discovered that this is possible even up to where the zygote contains four cells. If further experiments take place after the four cell development stage, just as in Roux's results, you'd get incomplete embryos. Driesch was fortunate in his selection of experimental animals because such cell division is limited to just a few species. [2]

Modern scientists have found both men to be partially correct with their theories—correct in that the embryo is "preformed", however, this occurs in the form of the inherited genetic code of deoxyribonucleric acid (DNA). Research has proven that the "blueprint" for development is contained in the DNA. [3]

Interesting Facts on Human Embryology . One can not but be amazed by the following facts surrounding prenatal development: (1) the original weight of the human zygote increases more than a billion times during the 266 days from conception to birth (imagine if the earth suddenly began to grow at the same rate; in less than a year it would be approximately 20 million times the weight of the sun); (2) from the original two simple germ cells, the egg and sperm, comes a nature human being consisting of 30 billion differentiated cells performing very complex tasks; (3) locked within those two germ cells are genetic codes that represent some traits of all of our ancestors; (4) from these two cells can come another Einstein, Bach, Rembrant, Curie, or Marian Anderson. Man has long had a desire to understand human conception and embryology, and the more he delves, the more he comprehends how much there is to learn. Two interesting unknowns are: (1) scientists are unsure of exactly how the intrauterine device (IUD) works, what mechanism does it trigger so as not to

allow the zygote to implant itself in the endometrium, [4] and (2) there is little or no knowledge of how the egg is capable of allowing only one sperm to enter it when in fact it is being bombarded by millions of them. [5] These and the many other facts and topics in this unit can be very enthralling to children of all ages and especially to those approaching reproductive age.

It goes without saying that a great deal of knowledge and data has been accumulated in this field, but like any other investigative science, many frontiers are still ahead.

The Human Reproductive Systems

The Male Reproductive System . At reproductive age the testes begin to produce sperm and production continues throughout the male's adult life. The sperm that are produced in the testes are microscopic; in fact they are so small that it would take 500 of them lined up tail to head to measure one inch. The mature male is capable of having 400 million sperm in each ejaculation. [6] The part of the testes that manufactures the sperm are the seminiferous tubules. After the sperm are produced they are stored in the epididymis; if the sperm are not used within a couple of weeks they begin to atrophy and the production process begins anew. The epididymis is a series of coiled tubes located on the top of each teste (check diagram for location). If these tubes, the epididymis, were stretched out they would each measure one meter.

Sperm production can be interrupted purposely or due to a medical trauma. The purposeful interruption is a medical procedure called the vasectomy, during this minor surgery the tubes that carry the sperm from the testes to the urethra are severed and tied off. This operation in no way hinders sexual functioning or the production of testosterone. Testosterone, the male hormone, is produced by the testes and is responsible for the onset of the male's secondary sex characteristics. The testes, which are also referred to as gonads, are located in a sac just under the penis (scrotum).

During sexual excitement the sperm make their way through the vas deferens to the urethra; while in the vas deferens they pass the seminal vesicles, the prostate gland, and the cowper's gland. These three glands each produce a secretion that mixes with the sperm to make semen. The volume of semen ejaculated during sexual excitement is about one teaspoon.

The Female Reproductive System . At reproductive age the woman's ovaries (gonads) usually produce one ovum a month. A female at birth has about 400,000 primitive eggs in her ovaries; however, over her reproductive life only 400 develop to maturity. [7] During each month of a woman's reproductive life time a mature egg will actually burst out of the ovary and find its way into the nearest fallopian tube, then slowly move toward the uterus. This trip can be interrupted by the presence of sperm in the tubes as the result of recent sexual intercourse. If there are sperm present the egg will be bombarded before it proceeds through the first third of the fallopian tube. After fertilization (the sperm nucleus combining with the egg nucleus), the egg continues its journey to the uterus. At this point the body becomes aware that it is pregnant and prepares the lining of the uterus (endometrium) to receive the fertilized egg. Nine months (266 days) after the sperm has entered the ovum it becomes a fully functional human being. [8] What happens during the nine month period, the prenatal period, is the subject of this unit.

Human Embryonic Development (Prenatal Period)

The prenatal period is divided into three distinct stages, the germinal, the embryonic, and the fetal stages.

The Germinal Stage . During this stage which begins with fertilization and ends when the ovum is embedded in the endometrium, the fertilized egg is referred to as a zygote. The duration of this stage is two weeks. The one cell zygote (the pronucleus of the egg has united with the pronucleus of the sperm to form one cell) at the end of the first has become a cluster of approximately 100 cells. Even at this early point the different cells are preparing to perform their individual tasks (differentiation). The external layer of the zygote serves as a protective skin and provides nourishment to the inner cells. The out cells (ectoderm) will later become the placenta, the umbilical cord, the Amniotic sac, etc.

MALE REPRODUCTIVE SYSTEM

(figure available in print form)

FEMALE REPRODUCTIVE SYSTEM

(figure available in print form)

The Embryonic Stage . The second prenatal period begins at the time of implantment of the zygote in the endometrium and ends eight weeks later. During this stage 95% of the body parts have appeared through the process of cell differentiation. [9] At the end of the first month three precise layers of cells have formed in the embryo (the zygote is now referred to as the embryo). Each of these layers serves a different function, the first becomes the ectoderm, the second the mesoderm, and the third the endoderm. At this time the embryo is about 1/4 of an inch long, which is about 10,000 times as large as the ovum that burst from the ovary. At the conclusion of this stage the embryo will be 1 1/4 inches long and weigh a whole 1/30th of an ounce.

The Fetal Stage . This stage is best represented by the following chart. The stage extends from the 3rd month through the 9th month.

(figure available in print form)

Sensory Development in the Fetus

At one time it was believed that the fetus was unable to sense much of anything while in utero, however, due to modern research we are reasonably sure that the fetus can touch, taste, smell, hear and see. Although at birth these senses may be considered primitive, they are in fact all operative.

Touch-the first sensation of touch appears in the skin of the face and gradually progresses downward over the rest of the body. [10]

Taste-the taste buds appear in the third month and are fully developed by about the seventh month. One researcher showed differences in amount of amniotic fluid ingested by the fetus when saccharine was introduced into the amniotic sac. [11]

Smell-premature infants have an olfactory sense; this was demonstrated when they turned their heads away from foul smells.

Hearing-fetuses have been found to react to very loud noises in utero. [12]

Vision-a full-term infant is capable of visually following a slow moving object,even premature babies are apparently capable of distinguishing between light and dark. [13]

Birth Defects . Of all the babies born in one year in the United States, 94% are perfectly healthy. But 6% have some form of birth defect. Many other pregnancies terminate before the end of the ninth month period for a variety of medical and genetic reasons. Specifically in the United States:

—3.3 million babies are born each year, of these 700 per day are afflicted with a birth defect.
—15 million people have suffered from a birth defect; 20% of these individuals are mentally retarded.
—500,000 conceptions never result in live births.
—1,500,000 preschoolers who suffer from defects have spent six million days in the hospital at a cost of $180 million each year.
—200,000 families have been affected by birth defects.
—18,000 babies die of birth defects before their first birthdays.
—genetic defects are the cause of 20,000,000 future life years being lost.
—1/5th of all birth defects have genetic implications.
—abnormal prenatal management is the cause of 50% of all mentally defective children.
—50% of all the mentally defective children in the previous statistic could have been normal if prenatal environment were improved. [14]

Genes and Genetic Counseling . In the beginning there is a merging of 23 chromosomes from the mother, contained in the egg, and 23 chromosomes from the father, contained in the sperm. Each child created by this union will have a full complement of 46 chromosomes of 23 pairs. Chromosomes can subdivide into small units, genes, which are the biochemical instructions for an individual’s traits.

Genes are classified as either dominant or recessive. Usually if a trait appears in the new offspring it is dominant. For example, if a father has black hair and the mother has blond hair, the dominant is black. Therefore, chances are good that the baby will have black hair. The implications of dominant and recessive genes on birth defects are important because if both parents are carriers of a recessive gene that causes a birth defect, the chances for it to surface in one of their offspring are about 25%.

The chart on the next page demonstrates how inheritance of genetic traits works.

If during a genetic work-up a birth defect is detected in the fetus the family can be given alternatives, including a cure if one is available. Genetic work-ups include, a paternal and maternal family history, ultrasound, fetoscopy, and amniocentesis.

Amniotic Fluid and Amniocentesis . At about the eighth week of conception the amniotic sac has developed. This sac is a pouch of saline fluid in which the embryo develops over the duration of the pregnancy.

The amniotic fluid contains cells and chemicals that are sloughed off from the developing embryo. The cells are from the embryo's skin, while the chemicals come from the urine and lungs.

Out of the need for better genetic screening, a procedure known as amniocentesis was developed. The way in which this is done is as follows: first, it is performed by an obstetrician, who uses a local anesthetic to numb the mother's abdomen. Next the doctor inserts a long thin needle through the abdomen wall and uterine wall and into the amniotic sac, where it draws in a small amount of that saline solution.

GENETIC COUNSELING

(figure available in print form)
NINE MONTH FETUS JUST BEFORE LEAVING THE WOMB
(figure available in print form)
To guide the doctor during this procedure, ultrasound is used. Ultrasound is employed to locate the exact positions of the embryo and the placenta, this is done so as not to puncture either. The optimum time for amniocentesis is about the sixteenth week of gestation. [15]

After the fluid is drawn, special tests are required for the detection of any abnormality. The fluid is spun in a centrifuge to separate all the different substances. The chemicals are then scrutinized for any abnormalities, these chemicals reveal information about the central nervous system and its development. If abnormal quantities of certain chemicals are present, we are almost certain that the increased amount is caused by some abnormality either in the brain and skull or the spine and spinal cord.

Amniocentesis can also be used to identify the sex of the embryo. This is important because there are certain diseases which are sex linked (check chart on page 7); that is they may only be inherited by a male embryo.

Even though this method of early detection is available, it is not always administered upon request, because of the uncertainty of its effects on the developing embryo. At this time the National Institute of Child Health is conducting an in depth study with 1,040 women who underwent amniocentesis. They are comparing the results of these pregnancies with the results of 992 other pregnant women who did not have this procedure performed. Early findings do not indicate any negative aftereffects due to amniocentesis. The investigators also found that in 99% of the cases amniocentesis predicted the presence of a defect in the embryo. [16]

As mentioned earlier, amniocentesis is fine for detecting genetic and chemical defects, but not developmental abnormalities that occur physically, such as were evident during the 1960's with the use of thalidomide. These physical problems can now be detected through the use of fetoscopy.

The fetoscope [17] is a tiny tube with a fiberoptic instrument on the end of it. Through this instrument the doctor can observe the developing fetus. This tool is used during the third stage of embryonic growth, the fetal stage.

The tube is inserted in the same manner as the needle used in amniocentesis. The fetoscope has a side arm attached to it through which another needle can be brought down to draw blood from the fetus or to take skin scrappings. The blood will assist the doctor in determining the presence of sickle-cell disease or Tay Sachs Disease. This is a new procedure which up until recently was employed only at the Yale Medical Center and the University of California at San Francisco.

Another device mentioned earlier and used in conjunction with amniocentesis or by itself is ultrasound. This instrument sends out harmless sound waves—these are so high in pitch that they are not detectable by the human ear. The instrument bounces these waves off the mother's abdomen and when the waves hit various internal organs or fluid they bounce off in different ways and strike a detector. The detector uses these waves to form a black and white picture of the site of the placenta and embryo. This is used instead of an x-ray machine because radiation exposure can cause birth defects in the unborn.

Effects of Nutrition on Prenatal Development

It has been recognized that maternal malnutrition during pregnancy may result in adequate growth in the fetus. For instance, we will examine the effect that it has on brain growth; if a fetus does not receive enough nourishment, the rate of brain cell division is seriously hampered. An extremely deprived fetus may have 20% fewer brain cell than normal. If an infant has been malnourished both in utero and infancy, it is tragic because the brain may be as much as 60% smaller than that of the normal child. [18]

There have been many studies which demonstrate the results of poor maternal nutrition during pregnancy and its effect on both fetus and mother. One such study conducted in 1942 by Ebbs, Tisdall and Scott [19] demonstrated some serious consequences. They examined 210 expectant mothers, all of whom had eaten poorly during the first four or five months of pregnancy. The investigators divided the population into two samples, one of 90 (experimental) and the other of 120 (control). The ninety mothers were given vitamins to supplement their diets so as to make them adequate; this was done during the last part of their pregnancy and for five weeks after the babies were born. The larger sample continued on an inadequate diet for the same period of time. The mothers whose diets were supplemented were in much better health, had less toxemia, less anemia, fewer spontaneous abortions, and fewer still births, fewer short gestation-period babies and fewer low-weight babies. Along with all of these benefits the well-fed mothers averaged 5 hours less in labor. The babies delivered by the nourished mothers were in better physical condition at birth, healthier during the first six months of life, experienced fewer serious diseases, fewer colds, and other minor illnesses.

Effects of Smoking on Prenatal Development

The effects of smoking on the unborn have been noted as far back as 1935 in the literature; a study by Sontag and Wallace [20] found that smoking one cigarette a day during the last month of pregnancy produced either an increase or decrease of fetal heart rate, both are hazardous. They also found that smoking can effect the whole circulatory system of the fetus. In 1957 Simpson [21] found that as a result of heavy smoking, expectant mothers who carried to term delivered twice as many low-birth-weight babies as nonsmoking mothers. The heavy smokers had twice as many low-birth-weight babies as moderate smokers. The sample in this study

was 7,449 pregnant mothers.

In a follow-up study Frazier [22] was able to replicate Simpson's findings. However, Frazier included in his conclusion possible reasons for these negative outcomes. He felt, first, that due to the heavy maternal smoking habits there is a decrease in appetite (you already are aware of the results of poor nutrition from the previous section). Second, smoking may constrict the placental blood vessels and thus decrease the oxygen supply to the fetus. Third, it is possible that a woman smokes heavily during pregnancy for the same reasons (such as tension and anxiety) that also cause low-birth-weight babies.

Effects of Alcohol on Prenatal Development

> "Behold, thou shalt conceive and bear a son:
>
> and now drink no wine or strong drink." Judges 13:7

In 1973, Jones and Smith [23] reported a syndrome that they labeled "Fetal Alcohol Syndrome" (FAS). They reported that this syndrome is characterized by defects that include prenatal and postnatal growth problems, microcephaly, abnormal development of the heart, defects of the joints, and facial abnormalities, especially of the eye.

A follow-up study by the same researchers and a few others looked at the records of a sample of 23 offspring born to heavy natural drinkers. [24] The results were that 17% of the infants died soon after birth. Among the survivors 44% were mild-to moderately retarded, and 32% presented with abnormal physical features.

For a while there was some thought on how much ingestion of alcohol actually caused FAS. Was it mild, moderate, or heavy drinking? Recent studies, especially one conducted by Hanson [25] in 1977, demonstrated that as little as two ounces of 100 proof alcohol consumed each day can cause a degree of FAS. In his sample of 74 women considered moderate drinkers 12% of the babies presented with one or more of the characteristics of FAS.

Effects of Drug on Prenatal Development

Over-the-Counter Drugs We in America are known as a pill-popping society. In a study conducted in California, [26] it was was found that the average pregnant woman takes more than three different drugs daily, and 4% of the women took ten or more different drugs. There are two major areas of concern when it comes to drugs and pregnancy; first, the proper dose for a 125 pound mother will be a very large overdose for a one or two pound fetus: second, the liver of the fetus is incapable of breaking down the drugs in the same way the maternal liver enzymes do, which result in the different manner in which the drug acts upon the developing fetus.

Drug Addicts—Heroin—On the average maternal addicts deliver smaller than average size babies with more

incidence of toxemia, premature separation of placenta, retained placenta, hemorrhaging after birth, and breech deliveries. A high rate of neonatal diseases, infant addiction, and mortality have been reported.

Lesson 1 Heredity and Traits

Concepts:
that we receive 23 chromosomes from each parent that traits are inherited that we inherit end carry dominant and recessive genes

Terminology:
chromosomes

genes

recessive

dominant

Title of Lesson: Whose Eyes Are These?

Introduction:
Did you ever wonder why you have different color eyes than your sister or brother or even your mother or father? It has to do with inherited traits, traits passed down perhaps from your great grandparents to your grand parents to your parents and finally to you. This exercise will give you an opportunity to get to know yourself and some of your traits. It will deal with just physical traits, if you have a desire to find out about other traits such as temperment, personality, etc., you may want to discuss this with your parents. Genetics is fairly new as a science and no one fully understands how much we inherit and how much is due to environment.

To the teacher:
You may wish to have the students do this exercise for credit or just for fun, feel free. Most traits are self explanatory, a few may take a little explanation, handedness, refers to whether a pers is right or left handed. Give students permission to use nonderogatory words for stature, i.e. stocky, slight, below average in height etc. Ask for volunteers to read their papers and ask if anyone found anything interesting. Suggestion: do one yourself and share it with your students.

Trait	Your Feature	Family Member with same Trait
hair color	_____	_____
hair texture	_____	_____
eye color	_____	_____
stature	_____	_____
handedness	_____	_____
earlobes (attached or	_____	_____

unattached)

others _____ _____

Lesson 2 Male Reproductive Anatomy and Physiology

Concepts:
that male's reproductive system is both internal and external

that the male's system is just as complicated as

the female's reproductive system

Terminology:
sperm

testes

semiferous tubules

epididymis

vas deferens

seminal vesicles

prostate gland

cowper's gland

bladder

penis

MALE REPRODUCTIVE SYSTEM

(figure available in print form)

Title of Lesson: Labelling and Explaining the Male's Reproductive System

Introduction: There are a lots of myths and nisconceptions having to do with the male's reproductive system, for instances, there are those who say that a man has just so many ejaculations in a life time and that he should be careful not to waste them, or that penis sex makes a difference as to sexual performance, both are false. During this lesson you will receive the facts about the male's internal and external reproductive organs,

To the teacher:
Reproduce the diagram on the next page and go over it with the students in class to be sure that everyone understands all of the parts of the male's reproductive anatomy. Be sure that all of the students understand

what each part does, it is necessary to go over this in order to understand conception and fertilization.

Lesson 3 Ethics and The Control of Reproduction

Concepts:
that artificial insemination is a Conception method that test tube babies can be normal that infertility does occur and what are the alternatives

Terminology:
vitro

artificial insemination

sperm bank

surrogate mother

ethics

Title of Lesson: Is Today 1984? Explain title using the book 1984.

Introduction:
You have no doubt been reading in the newspaper and hearing on the radio and Television about test tube babies. Do you know what it is all about? Do you understand the moral and legal issue surrounding it? We are at a time in history when this is occurring and there have been a great deal of arguments both pro and con. What do you think for instance about the man that has a sperm bank containing the sperm of some nobel prize winners, for that matter what do you know about sperm banks? What is infertility? You are going to be responsible for reporting in a paper about the issues surrounding any of the following:

1. test tube babies

2. sperm banks

3. surrogate parents

4. sterilization

5. artificial insemination

To the Teacher: Give the students some of the examples of recent concerns about the above subjects. There have been many articles appearing in the media lately. Explain what the ethical issues are without revealing your our feelings. Perhaps you may want to set up a debate or have a trial where a surrogate mother has decided to keep the baby after its birth, what about contracting as a surrogate parent,is it biding. Be careful not to destroy or tamper with any individual’s set of values, just give them an opportunity to express their feelings and concerns. Keep the papers short perhaps less than three pages and be prepared to discuss any interesting ones.

Notes

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5. Katchadourian,————————————————————
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7. Nilsson, Lennart, *A Child Is Born* , Delacorte Press, New York, 1978.
8. Annis, Linda F. *The Child Before Birth* , Cornell University Press, Ithaca, New York, 1978.
9. Rugh, R. and L.B. Shettles. *From Conception to Birth: The Drama of Life's* Beginnings, Harper & Row, 1971.
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12. Nash, John. *Developmental Psychology: A Pyschobiological Approach* . Prentice Hall, Englewood Cliffs, N.J. 1970.
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14. Brody, Jane E. How Doctors Can Assure More Perfect Babies. *Women's-Day* , Feb., 1977, pp. 65, 150, 152, 154.
15. Schuman, Wendy. *Early Life in The Womb, Parents* , July, 1980, pp. 50-54.
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21. Simpson, W.J. Preliminary Report on Cigarette Smoking and The Incidence of Prematurity. *American Jour. of Ob. and Gyn* ., 1957. 23:808-815.
22. Frazier, T.M., G.H. Davis, H. Goldstein, and I. Goldberg. Cigarette Smoking: A Prospective Study. *American Jour. of Ob. and Gyn., 1961, 81:988-996* .
23. Jones, K.L. and D.W. Smith. Recognition of the Fetal Alcohol Syndrome in Early Infancy. *The Lancet* , 1973,2:999-1001.
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25. Peckham, C.H. and R.W. King. A Study of Intercurrent Conditioned Observed during Pregnancy. *American Jour. of Ob. and Gyn* ., 1963, 83:609-624.
26. Peckham, C.H. and R.W. King.

Teachers Reading List

Books

All of those recommended to the students

Articles

1. Berlm, C.M. and C.B. Jacobson. Link Between LSD end Birth Detects Reported. *Journal of American Medical Association* , 212:1447-,1970.

This brief report summarizes the findings and conclusions of two doctors who studied the link between LSD and birth defects. They studied pregnancies in which LSD was taken by at least one parent before and after the infant's conception. Although a high correlation between LSD use and birth defects was found, the data did not prove LSD conclusively that LSD causes birth defects.

2. Butler, N.R., H. Goldstein, and E.M.Ross, Cigarette Smoking in Pregnancy, *British Medical Journal* , 1972, 2:127-130.

The purpose of this study was to determine whether smoking itself (rather than the type of woman who smoked) is harmful to the fetus. The birth weight and perinatal mortality of the babies of women who continued to smoke during pregnancy and those who discontinued were compared.

3. Dayton, Delbert H. Early Malnutrition and Human Development, *Children* , 1969, 16:210-217.

This paper reviews research on the effects of malnutrition on human physical growth and mental development in the United States and less affluent countries. This article examines the following questions: Are there critical periods during which malnutrition produces organic damage? If so, is the damage irreversible? Economic and social factors relating to malnutrition are considered.

4. Etzoni, Amitai, Doctors Know More Than They're Telling You About Genetic Defects, *Psychology Today* , Nov. 1973, 7:26-29, 31,35, 36, 137.

This provocative article, by exploring the pros and cons of amniocentesis, examines the reasons doctors often do not inform pregnant women about it. The author addresses the important and controversial question of who should decide whether amniocentesis should be performed.

5. Friedman, Theodore. Prenatal Diagnosis of Genetic Disease, *Scientific American* , Nov. 1971, 225: 34-42.

This paper discusses the genetic diseases which can be detected by amniocentesis, and the extent to which the control of defective births is justified on social and biological grounds.

6. Hanson, James W., Kenneth L Jones, and David W. Smith. Fetal Alcohol Syndrome: Experience with 41 Patients. *Journal of The American Medical Association* , 1976, 235:1458-1460.

Forty-one patients with the Fetal Alcohol Syndrome were studied to determine the symptoms which make the disorder recognizable in infancy. The mental and physical abnormalities that the patients incur are discussed

Students Reading List

Books

1. Annis, Linda F. *The Child Before Birth* , Cornell University Press, New York, 1978.

This book examines prenatal development and factors influencing the unborn child, such as nutrition, maternal characteristics and experiences, drugs, and diseases.

2. Nilsson, Lennart, et al. *A Child is Born* . Delacorte press, New York, 1978.

This book is an essay in picture of the prenatal development of a child. The photograph are unparalleled. It takes you though the pregnancy of a young couple discussing every factor along the way to birth.

3. Volpe, E.P. *Human Heredity and Birth Defects* . The Bobbs-Merrill Co. Inc., New York, 1971.

This book is written for the layman and is interspersed with historical views and attitudes toward congenitally deformed humans. It is recommended for both teachers and students.

4. Winchester, A.M. *Human Genetics* , Charles E. Merrill Pub. Co., Columbus, Ohio, 1971.

This teacher and learner resource book presents easily understood information on genetics.

Articles

1. Bell, Joseph. When Babies Go Hungry, *Good Housekeeping* , June 1974, 3:92

This is a tragic report on the WIC (Women, Infants, and Children) program that barely got off the ground. The purpose of WIC is to prevent mental retardation by giving food to mothers and their babies (malnutrition is a cause of mental retardation).

2. Clark, J.P. The Prevention of “Rhesus” Babies. *Scientific American* , Nov. 1968, 119:46-52.

This paper describes a successful method of preventing anemia in babies born from an Rh-positive father and an Rh-negative mother. The technique involves infecting an antibody called anti-Rh into the mother. The benefits and risks of this procedure are examined.

3. Drugs in Pregnancy: Are They Safe. *Consumers Report* , Aug. 1967, 32:435.

This paper warns us about the damage to the fetus that can be caused by drugs taken during pregnancy. Seven recommendations on drug use for pregnant end “potentially pregnant” and nursing mothers are provided to prevent drug-caused malformation in babies.

4. Schuman, Wendy, The World’s First Photos of Early Life in the Womb, *Parents* , July, 1980, pp. 50-55.

This fascinating article discusses how fetoscopy, a method used to diagnosis genetic disorders, may someday be instrumental in the treatment of diseases before birth. The paper includes vivid photographs of the developing embryo, from 6-9 weeks after conception.

Audio Visual Aids

1. Prenatal Development, 16mm Film, color, 23 minutes, CRM/McGraw Hill Films, Del Mar, Calif.

Interviews with researchers and footage of the developing fetus are combined to bring the viewer the lates theories and information about biological and psychological growth which occurs during the fetal stage of embryonic growth.

2. Prenatal Care, Filmstrip/Record Combination, National Health Films, Atlanta, GA.

Live-action photography and color-art are used in illustrating the various aspects of care. Emphasis is placed on the importance of early and continuous prenatal care for every mother during each pregnancy.

3. Pregnancy and Birth, 16mm Film, color, 12 minutes, Educational Film Division.

Embryo and fetal development from the moment of conception until the birth of the infant are covered. Illustrations of the stages of the fetus are shown and explained.

4. Human Sexuality Transparencies, Overhead Transparencies, DCA Educational Products, Inc.,

This set of transparencies covers male and female anatomy, adolescent growth and development, human reproduction, prenatal development and birth.

5. Human Growth and Development, 10 Filmstrips and tapes, International Teaching Tapes, Inc.

These tapes and filmstrips present an overview of heredity. They include, Who do you look like, Changing from girl to woman, Changing from boy to man, How traits are inherited, How living cells divide, How sex is inherited, How environment influences our inherited traits, Endocrine gland and hormones, Menstruation and pregnancy, Gestation and birth of a baby.

6. Inside My Mom, Filmstrip with cassette, March of Dimes.

The concept that good nutrition is a basic element of life and is necessary for optimum prenatal development is the theme of this entertaining and informative cartoon.

7. Life Before Birth, 2 Filmstrips and cassettes, Time Inc.

These filmstrips show photographs of actual embryonic and fetal development up to the ninth month. The filmstrips illustrate fertilization, cell division, and implantation. The photographs are excellent.

8. More Than Love, Filmstrip and cassette, March of Dimes.

This filmstrip emphasizes that having a baby is a serious decision and that getting prenatal care is important. It also discusses and illustrate congenital birth defects.