CHAPTER 9
Pregnancy and Birth

The development of an embryo from the implanted blastocyst that we saw in the chapter on conception to the baby that finally enters the world is a fascinating process that has been slowly elaborated over recent centuries.

After the blastocyst has implanted, it converts into a three-layered larva - the gastrula. In all chordates (all vertebrates and some invertebrate marine animals), this then forms a slightly elongated embryo with a bulky head and a tapering tail with the elementary nervous system in the form of a hollow tube running from end to end and, under that, the notochord (skeletal rod), both tube and rod being flanked by muscle blocks (somites) arranged segmentally down the length of the body.

In chordates, the principal body cavity holds the guts and viscera generally. The kidneys originate in all vertebrates from the narrow connections between the cavities of the segmental muscle blocks and this cavity.

The brain starts as a slab of cells in the upper layer of the embryo, which becomes irreversibly different from other cells about three weeks after gestation. Different parts are already designated to form specific relations with the body in the future. Both brain and body of the embryo have bilateral symmetry but there are hidden differences between right and left halves. Brain and spinal cord roll into a hollow cylinder then, in a few days, cell multiplication occurs around the central cavity and cells migrate outwards to form rudimentary brain nuclei in the wall of the tube. Some cells become neurones (nerve cells) and others change into non-neural support cells.

The eyes of vertebrate animals (those with a backbone) are formed through a conjunction of an outgrowth from the brain, which becomes the retina, with a thickening of the ectoderm (the outer layer), which becomes the lens.

The hypothalamus, the foremost ventral component of the embryo brainstem, as well as controlling appetites and aversions, acts as a coordinator between the activities of the central nervous system and the endocrine system - glands that secrete hormones controlling growth, metabolic activity and sexual development.

If one cuts across the embryo at this stage, only an experienced embryologist can tell to which class of animal it belongs. This gave rise to the doctrine of recapitulation, which says that an animal, in its embryonic development, repeats its evolutionary development. Thus, the gastrula larva was held to repeat the stage of development seen today in hydroids and jellyfish. While few today would hold to such a strict interpretation, there perhaps remains a germ of truth in the idea.

Embryonic development is guided by instructions contained within the DNA of the chromosomes of the zygote. These instructions are preformed, but their carrying out depends upon the right sequence of stimuli from the environment and from the cells into which the embryo itself develops. Thus, when embryo nerve cells migrate and form into patterned aggregates, and when they grow long, branching axons that sort themselves into an intricate, crisscrossing array to make up patterned circuits, they communicate by biochemical expressions of regulator genes that can switch the actions of other genes governing nerve cell development. There are message-emitting and message-receiving sites on the cell surfaces. These respond to hormones and growth substances that are produced by cells of all kinds.

The mother is intimately involved in the survival of the foetus - and not entirely in a spirit of happy cooperation and nurturing. In many cases, foetal actions are opposed by maternal countermeasures.

During implantation, foetally derived cells of the trophoblast invade the lining of the womb and remodel the spiral arteries there into low-resistance blood vessels that cannot constrict. This gives the foetus direct access to its mother's arterial blood and prevents her reducing the nutrient content of blood reaching the placenta without reducing the nutrient supply to her own

tissues. It also means that the volume of blood reaching the placenta becomes largely independent of control by the local maternal vasculature and that the foetus is able to release hormones and other substances directly into the maternal circulation.

Placental hormones, including human chorionic gonadotropin and human placental lactogen, manipulate maternal physiology for foetal benefit. Without human chorionic gonadotrophin, pregnancy cannot continue. Human placental lactogen acts on maternal prolactin receptors to increase maternal resistance to insulin. If unopposed, the effect of this would be to maintain higher blood glucose levels for longer periods after meals. This action is, however, countered by increased maternal production of insulin. Gestational diabetes develops if the mother is unable to mount an adequate response to foetal manipulation.

Similarly, the foetus enhances the flow of material through the placenta by increasing maternal blood pressure. Preeclampsia, a dangerous increase in the mother's blood pressure, can be interpeted as an attempt by a poorly nourished foetus to increase its supply of nutrients by increasing the resistance of its mother's peripheral circulation.

The mother is not entirely powerless in all this; in fact, she apparently exercises a kind of quality control. Nearly eighty percent of human conceptions never come to term, with most miscarriages occurring before the twelfth week of pregnancy and many within the first twelve days. The majority of these have recognised chromosomal abnormalities but a fair proportion of them occur when the father has either A or B blood group antigens in his blood and the mother does not. If these antigens are passed on to the baby, the mother can produce an immune reaction involving natural killer cells, which will destroy the baby.

A similar thing happens with Rh babies. If the baby inherits the Rh blood group antigen from its father and the mother does not have it in hers, she reacts by producing antibodies that destroy the baby's red cells. It is routine nowadays to prevent this by blood grouping mother and father and immunising the mother if necessary. If this has not been done, the baby's life may still be saved by exchange transfusion of virtually all its blood.

On the whole, though, as we can all attest, the mother's immune system does not harm the baby. Why this is so is something that has intrigued immunologists ever since there was immunology; after all, the baby is essentially a foreign organism inside the mother's body.

The growth of organ transplantation has increased the interest even more. The hope is that, if we can learn the complete answer, we will be able to stop using the immunosuppressive drugs we are now forced to use. These have a number of nasty side effects, especially a greatly increased risk of infections.

It is likely that the natural system works similarly, by producing substances that suppress the immune system. The problem is that, if all the ones we know about worked the way they are supposed to, no pregnant female would survive pregnancy; she'd certainly die of one or another infection.

It is true, however, that pregnant females are far more susceptible to a variety of infections than are those who are not pregnant. Fortunately for all of us, women are genetically more resistant to a variety of infections and diseases than are men.

On the other hand, pregnancy may help protect a woman against cancer. This appears to be because cancer cells are very like foetal cells in structure (this structure is what enables both of them to grow so much) and the mother is immunised by these antigens from the foetus and can then attack cancer cells of similar structure.

Mum more than returns the favour by passing to the baby in her womb antibodies that fight against most of the common dangerous microorganisms. If she did not do this, it would quickly die of infection soon after - or even before - birth.

Given the activities of the foetus, it is no surprise that pregnancy has a profound effect on the mother - though pregnancy in the primitive state is by no means as incapacitating as it has become in advanced societies (but there is a definite trend in advanced societies for mothers to continue activities much closer to term and to resume them much sooner after birth than was the

case only a few decades ago).

Though noone is yet sure how morning sickness is produced, it is likely that hormones and other products put into the mother's bloodstream by the placenta are responsible. Why is it in the interest of the future baby to have the mother ill at this stage? Perhaps the reason lies in the fact that she is generally not hungry and particularly avoids bitter tasting foods, which can indicate the presence of plant toxins that can have serious negative effecets on the formation of body organs of the foetus.

Sometimes, a young woman in the latter half of her first pregnancy suddenly has her blood pressure shoot up; she swells up; she pisses out protein; she may go into convulsions. This toxemia of pregnancy appears to be due to a genetic defect causing the failure of a protective immune response against the baby.

The intriguing thing is that this seems to occur if the female has inherited two identical copies (one each from her mother and father) of a particular gene, but not if the two genes of the pair are different. Even more intriguing is that, at least in mice, males tend to choose mates with a different gene in this site, and that they do this by smell. Perhaps even in humans, even with our relatively feeble sense of smell, the secret of a successful pregnancy is for the male to follow his nose.

Some forty percent of women find their interest in sex declines during the first six months of pregnancy. This increases to 75 percent in the last three months. Part of this is purely physical - acute morning sickness, physical discomfort, tiredness - but it may also be due to such psychological factors as negative body image, having achieved from sex what she needed from it (a baby), or fears of harming the baby (unless there are special problems, such fears are completely groundless, with the exception that orgasm may trigger birth prematurely in women prone to do so).

On the other hand, other women report feeling more sexual than ever during pregnancy, especially during the second semester, when there are no longer problems with morning sickness and the bulk of the baby in the womb is not yet sufficient to produce discomfort. Part of this may be psychological - a feeling of fulfilment, a greater closeness with the partner - but may also have to do with the fact that the uterus is engorged with blood, a situation reminiscent of that occurring during foreplay in sex.

Unfortunately, men do not experience the same decline in sexual interest during their wives' pregnancies. Less than ten percent of husbands lose their urge during the first three months, while less than twenty percent do so during the second three months. The gap does lessen considerably during the final three months, when over sixty percent of males have lost interest. The discrepancy between male and female desire is bound to cause problems if not handled well. However, if you and your partner can talk to each other honestly, a little creativity, romance and patience will see you through the inevitable disruption to your sex life that pregnancy entails.

Doctors have tended to be rather too conservative about sex during pregnancy and after birth. Don't accept blanket bans without an adequate reason. In a mutually monogamous union where neither partner has a sexually transmitted disease (these should always be tested for and treated if present) and where the mother has no special medical problems (and does not develop any pregnancy-related problems), there is no good reason sex cannot continue virtually up till term (in some societies, orgasm is actually used to initiate childbirth).

Doctors will also generally tell you to abstain from intercourse until six weeks after childbirth, but about half of couples ignore this advice and experience no problems. After caesarean deliveries, it is wise to wait a week or two. After a normal vaginal delivery, if there has been no tearing or surgical cutting of the vagina or perineum, sex can resume almost immediately. Tears and episiotomies (surgical cutting of the perineum) will usually heal within three weeks but can also cause painful intercourse for months (in fact, about sixteen percent of women who have had episiotomies still find intercourse painful after a year).

Frankly, all this is likely to be somewhat irrelevant. Female desire tends to remain at a

pretty low ebb, or even decrease further, after childbirth. This is partly due to the birth-associated battering her genital organs has taken. Also, the placenta takes over hormone production from the ovaries during pregnancy. When the placenta is expelled at birth, this production naturally ceases and the ovaries do not resume their production for some time after. Breastfeeding also diminishes the body's production of oestrogen.

The major reason, however, is sheer fatigue, which can also affect the male partner. At least sixty percent of couples are still having less sex a year after a baby's birth than they did before. The answer again is communication, imagination, romance and patience.