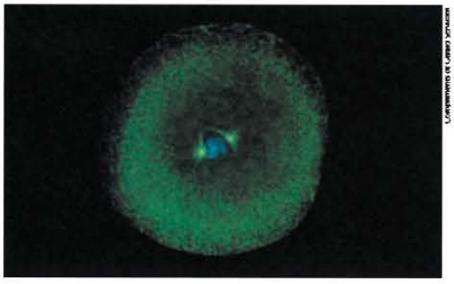
However, fertilization cannot be studied in spare embryos (they are already fertilized), and a high occurrence of chromosomal abnormalities limits other research. Therefore, the panel considered whether the arguments justifying research on spare embryos apply to research embryos.

Green, for one, finds the distinction puzzling. He says: "Every time a couple goes in for infertility treatment, they are prepared to bring into existence embryos that will not be transferred. Why is that acceptable when it is not acceptable to create embryos for, say, cancer research?"

Speaking in favour of the creation of research embryos, Brigid Hogan, co-chair for science on the panel, told Varmus's advisory committee that about one-third of the research underway in Britain involves research embryos, much of it directed at fertilization.

At first glance, President Clinton's instruction to Varmus means that similar fertilization research cannot go ahead in the United States. However, much depends on how conception and the creation of an embryo are defined. Does conception occur when the sperm first comes into contact with the egg, when it penetrates the egg or when the chromosomes of the sperm and the egg align to form a new genetic identity? The latter process occurs about 9 to 12 hours after the sperm begins to penetrate the wall of the egg.

The State of Victoria in Australia permits fertilization of eggs for research up to this point, according to Green. There scientists can investigate the basic molecular interactions that occur at the surfaces of the sperm and egg, as well as the origin and development of cellular structures during this time.



A research embryo: subject of dissent.

Such research is important for new contraceptives, understanding infertility, and *in vitro* fertilization (see page 47).

For those such as Congressman Robert K. Dornan (Republican, California), who intends to campaign against all embryo research during the coming session of the US Congress, such definitions will presumably be irrelevant. But the NIH's advisory committee and the Human Embryo Research Panel hope that further education on the early stages of human development will convince more members of the public that preimplantation embryo research is ethically justified.

All such research, according to the panel's report should conform to general guidelines. These include using the fewest embryos possible for a given protocol; performing the experiment in the shortest possible time; using embryos only if gamete or animal studies would not meet the research goals; and no purchase of gametes or embryos.

The panel also accepts research on parthenotes (eggs fertilized in the absence of sperm) providing they are not intended for transfer. Such work could provide information on how and why one of a pair of identical genes — either the mothers or the fathers — is switched on (genetic imprinting).

Providing that research proposals (the NIH has received 70 so far) are not specifically precluded and that they conform to general guidelines, the panel considers them acceptable. Some examples of research that the panel found unacceptable include cloning; fertilization and transfer to the womb of eggs from fetuses; transfer to the womb of parthenogenetically activated eggs; development of chimaeras; and preimplantation genetic diagnosis for sex selection.

The panel also debated who should be permitted to donate eggs and embryos. They concluded that healthy women, even if they volunteer, are not acceptable donors because of the risks associated with collecting eggs. Those undergoing abdominal surgery or infertility treatment can donate eggs providing there is informed consent and no payment.

The panel also identified grey areas, where research is unacceptable now, but may in future merit further review. That review could be undertaken by an *ad hoc* group monitoring the ethical and scientific content of research proposals. Such a body might, like the NIH's Recombinant DNA Advisory Committee, comprise half scientists and half lay members.

Varmus now has the unenviable task of sifting through the panel's recommendations, considering public objections to the work and deciding on a course of action that he can defend in congressional hearings during the coming year.

HELEN GAVAGHAN

Gavaghan is a freelance writer based in Washington, DC

Haemophiliacs seek compensation

LONDON

The consequences for haemophiliacs who were exposed to hepatitis C virus after receiving frozen blood concentrates are beginning to surface with the recent report that in the United Kingdom in 1993 twelve men died from liver failure as a result of the infection. Four had to have liver transplants. The Haemophilia Society has begun a discreet campaign to get financial assistance from the British government for the families of those who have died, and to support men who have become ill as a result of receiving blood products from infected donors.

A national registry in Oxford, set up in 1977, has records of 3,122 men receiving blood concentrates between then and 1985 (when sterilization by heat treatment began). There have been no recorded infections since 1986.

Hepatitis C was first identified in 1987; screening of blood donors for hepatitis C became mandatory in the United Kingdom in September 1991.

Publicity concerning the haemophiliacs' plight has also focused attention on the fact that 3,000 other people may have been infected with hepatitis C from blood transfusions. This estimate is based on the level of infection detected since screening of blood donors began. Unless they have had blood tests, most do not know they carry the virus because they are asymptomatic.

In seeking financial help from the government for its members, the society is using as a precedent the £42 million settlement reached in 1991 for the 1,200 men exposed to human immunodeficiency virus from infected blood products.

The Society's task is made all the more difficult by the fact that — in contrast to HIV — most of those who are infected with hepatitis C are not as yet ill, and may not become so. The infection persists in 80 per cent of cases, causing chronic hepatitis. Between 20 and 30 per cent go on to develop cirrhosis, but often not until 20 years after infection. In a few cases, there is a progression to liver cancer after about 30 years.

NUALA MORAN

Moran writes for the Independent on Sunday