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HEPATITIS-YET ANOTHER RISK OF IN VITRO FERTILIZATION?

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Synopsis – In late 1987 and early 1988 at the Dijkzigt Hospital (Rotterdam) program for *in vitro* fertilization (IVF), 172 women were exposed to hepatitis B virus when culture medium used for fertilization, early embryonic development, and embryo transfer contained virus-contaminated human blood serum. Although adding serum to culture medium has never been proved necessary, this is a common practice worldwide. People sick with hepatitis B can be minimally to extremely ill; occasionally it leads to infectious carrier state, fatal liver disease, or liver cancer. During labor and delivery infants almost invariably become infected from mothers with active or carrier hepatitis. Interviews with five women (four with hepatitis) who had had at least three failed attempts at IVF reveal strong drives to have children and faith that the technology will eventually work. Ethical and feminist issues illuminated by this accident are the unethical, cavalier use of blood; risks even to IVF workers; the experimental, hocus-pocus nature of IVF; and the risks of putting human reproduction into the hands of third parties.

Second Witch:
Cool it with a baboon's blood
Then the charm is firm and good. . .
First Witch:
Pour in sow's blood, that hath eaten
Her nine farrow; . . .
(Macbeth, Act IV, Scene I)

How could anyone contract hepatitis by *in vitro* fertilization (IVF)? Yet 172 women in the first and largest Dutch IVF program, at Dijkzigt Hospital in Rotterdam, were indeed exposed to hepatitis B during an 11-week period late in 1987 and early in 1988. Through a laboratory accident at Erasmus University—which carries out the fertilization and cleavage steps for the Dijkzigt program—the blood serum added to the IVF culture medium contained active hepatitis B virus (HBV) (de Lange, 1988a; Volkskrant 1988a, 1988b, 1988c).

Of some 264 women (the exact number was not released[1]) who underwent IVF during the 11 weeks before 21 January 1988, 172 reached the embryo transfer step. Each of these women had one or more early embryos inserted through the cervical canal along with approximately 50 µl (Zeilmaker *et al.,* 1984) of the contaminated culture medium. In addition, five patients undergoing artificial insemination by donor (AID) had received semen that had been washed and cen-trifuged in this same contaminated medium (Volkskrant, 1988c).

The situation came to light on the 1st of March when three IVF clients reported to the hospital with jaundice (Nieuwsblad van het Noorden, 1988). The co-directors of the program, physiologist Gerard H. Zeilmaker and gynecologist Albert Th. Alberda, suspended treatment for all women currently undergoing ovulation induction while the hospital traced the source of the infection (de Lange, 1988a).

The 177 exposed women were contacted by phone or letter, and by March 7, 172 of them had reported for tests and HBV vaccine (Volkskrant, 1988b). By mid-April, 25 of them (14 percent) had come down with jaundice (Volkskrant, 1988c), including seven of the 38 women who had actually become pregnant (Trouw, 1988b); another 30 women (17 percent) and two partners without symptoms had positive tests for HBV (de Lange, 1988a). The number of infected women is expected to increase,

since the incubation period for HBV can be as long as five months (de Lange, 1988a; Hollinger, 1985). The number of infected partners may also increase, since hepatitis B is spread by sexual contact as well as by blood. In fact, it can be considered to be a sexually transmitted disease (Thiel, 1988).

The source of the HBV contamination was traced to a pooled blood sample taken from pregnant women in the regular obstetric clinic at Dijkzigt Hospital. According to Alberda, the IVF program supplemented its culture medium with serum from "normal" pregnant women because they believed that this might improve the success rate, especially among women with idiopathic infertility (deLange, 1988a).

After a detailed investigation, Dr. H. van Osch, Inspector of Public Healthfor South Holland, released his report in May 1988 (Volkskrant, 1988c). He found that, in the early years of the Dijkzigt IVF program, technicians in the obstetric clinic included reports on the blood tests they had done along with the blood samples sent to the embryology laboratory. In 1987, however, administrative personnel at the clinic were to have taken over this responsibility, but this new policy did not get carried out. Apparently, the Erasmus University embryology laboratory workers assumed that the blood which arrived was OK when no reports came; apparently, too, there were no records as to which specific clinic patients had blood in the pooled sample (Volkskrant, 1988c).

"Sooner or later this would have led to an accident," said Van Osch. "It is not so sur-[1]prising that it went wrong in the last quarter of 1987" (Volkskrant, 1988c). He specified that serum for culture media must hereafter be obtained from an established blood bank. By August 1988, the protocol he required was in place and the IVF program could and did resume.

Alberda and Zeilmaker had started attempting to fertilize human ova at Erasmus University/Dijkzigt Hospital as early as 1979 (Zeilmaker *et al.,* 1987). By 1982 the first Dutch baby from IVF was born. For the 12-month period starting mid-October 1985, they reported 92 pregnancies (with 109 fetuses) lasting 12 or more weeks (Zeilmaker *et al.,* 1987).

Meanwhile the co-directors reported twins born in December 1983, from one frozen and thawed 8-cell embryo (Zeilmaker *et al.,* 1984). These did not qualify as the world's first frozen embryo babies because the mother's tubes were not blocked and she had had sexual intercourse near the time of embryo transfer (Zeilmaker *et al.,* 1984). Freezing continues to be an integral part of the Dijkzigt protocol. In fact, during the 11-week period when the contaminated blood was used, about 100 "extra" embryos were frozen for some 40 of the 172 couples. They will be held until the outcome of the pregnancies is known (Trouw, 1988b).

STANDARD PRACTICES IN IVF LABORATORIES

Zeilmaker's and Alberda's use of pregnant women's serum in the culture medium is an excellent example of the hocus-pocus that is common to many laboratories' IVF procedures[2]. They guessed – with absolutely no evidence – that such serum would improve success percentages. Indeed, Barry Behr, an embryologist at the Northern Nevada Fertility Clinic in Reno, a private U.S. IVF unit, speculates that it should increase failure. According to Behr, the chorionic gonadotropin, always present in pregnancy serum, is toxic to human eggs at certain concentrations (Behr, personal communication).

Obviously, the laboratory steps of IVF (fertilization and then cleavage) are vital to its success. Indeed, many of the clinics that open and close with never a live birth fail at this very step. Many clinics also hire veterinarians who have experience with embryos of farm animals. In spring 1987, the only Australian still working in

the United States with the franchise IVF-Australia was an embryologist (Battle-Mutter, personal communication).

Some of the world's clinics gradually work up to getting about 90 percent of retrieved eggs fertilized, provided that the semen is functional[3]. Of those fertilized eggs, 90–95 percent actually cleave and can be transferred (Boyers and DeCherney, 1987). Every now and then a functioning clinic has a dry spell when no eggs fertilize or divide. Then there's a scramble to guess at what went wrong – did something happen to the water? are these new plastic dishes embryotoxic? In Dijkzigt-Hospital a failure to get any pregnancies one month (March 1986) was attributed to a small change in laboratory procedure (Alberda *et al.,* 1987). In Hammersmith Hospital in London a much lower than usual rate of fertilization and cleavage occurred while the walls of the laboratory corridor were being painted (Hillier *et al.,* 1985).'

Lucinda Veeck, Director of Embryologyat the Jones Institute in Norfolk, VA (where the first US. IVF baby, Elizabeth Carr, was conceived), frequently presents papers on IVF laboratory quality control. In Norfolk, temperature and gas concentrations in the incubators are monitored daily, with safety alarms also hooked up (Veeck and Maloney, 1986); media pH and osmolality are checked daily. Most important, however, seems to be the mouse embryo test. Each week female mice are superovulated with hormone injections mated, and killed 40 hours later. Usually about 30 2-cell embryos are flushed from each mouse's oviducts. These embryos are cultured in the medium undergoing "quality control." If they develop to the blastocyst stage, the medium is considered satisfactory for use with human eggs (Hillier *et al.,* 1985; McDowell *et al.,* 1988; Veeck, personal communication; Veeck and Maloney, 1986).

To prepare medium for the fertilization step, most clinics worldwide start with a commercially available buffered saline dry mix (Boyers and DeCherney, 1987; Veeck and Maloney, 1986). For example, Ham's F-10 mixture, used at the Jones Institute, contains eight salts, glucose, 20 amino acids, and several B vitamins, among other ingredients. This is mixed with ultra-filtered water, penicillin, streptomycin, and some buffer salts. Finally, 7½ percent blood serum is added. The same medium is used for growth and division, with the serum portion increased to 15 percent (Veeck and Maloney, 1986).

The serum has been "heat-inactivated" by being heated to 56°C and held there for one hour. This is more than hot enough to kill HIV (the AIDS virus), but not enough for HBV. Tests for HIV, for HBV, and for antibodies to them are conducted before the heat treatment.

To the best of my knowledge only Dijkzigt Hospital's IVF program used pregnant women's serum. Reporting at the end of 1984, 61 percent of the world's units—including the other five official centers receiving subsidies from the Dutch government (deLange, 1988a)—use the IVF client's own serum (Sep-pala, 1985). In the United States, this source of serum is used at Yale University, at the Northern Nevada Fertility Clinic, and at IVF-Australia, among others (Boyers, Behr, Baldwin, personal communications). In cases where a woman has antibodies to her partner's sperm, many units use a preparation from cow's blood, that is, bovine serum albumin (BSA). In such cases, however, IVF-Australia uses tested donor serum, and the Nevada clinic uses either BSA or donor serum. Some clinics, such as the one at Cedars-Sinai Medical Center in Los Angeles, use BSA routinely for all IVF clients (Behr, personal communication).

In some U.S. units, pooled cord blood from placentas taken immediately after delivery is used. The Jones Institute, uses cord blood (Veeck and Maloney, 1986), and Veeck defends this choice because cord blood allows mouse embryos to begin to develop placentas (Veeck, personal communication). Ball *et al.*

(1985) from the Mayo Clinic say cord blood solves the problem of antisperm antibodies in IVF clients' blood and allows "quality control" and standardization for everyone. These "advantages" applied also to the Dijkzigt Hospital's pooled blood sample that led them into trouble.

Blood serum allegedly serves as a protein source for early embryo development, but there is no real evidence that it is necessary (Meneso *et al.,* 1984). Furthermore, it turns a precisely defined medium into an undefined one, like the witches' brew in *Macbeth.* Some studies have attempted to evaluate the effects of, for example, human serum vs. no serum; BSA vs. human serum; cord serum vs. client's serum; or low fractions of serum vs. higher fractions (Boyers and DeCherney, 1987: 428). Most results show no significant difference, although some parameters (percent eggs fertilized, embryos dividing, pregnancies achieved, etc.) may sometimes seem to be affected. For example, Zeilmaker and his team (1987) at Erasmus believe that their success increased when they lowered the fraction of serum in the medium from 15 to 7½ percent, but at the Mayo Clinic, Ball and co-workers (1985) found no difference in outcome between media supplemented with the IVF client's serum or with cord serum.

Anita Direcks, co-director of DES Action Netherlands, analyzed the situation well when she commented to a Dutch reporter:

> "The events in Dijkzigt show that IVF is always a medical experiment with risks that can't be predicted. Just as with DES, they assume that this technology is safe until the contrary is proved. For years on end women swallowed DES . . . 'No, it can't do any harm' . . . Lovely children came, but when they grew up, the disastrous after-effects of DES came to light" (de Lange, 1988b)[4].

HEPATITIS

Hepatitis B is an elusive disease. Its incubation period may be anywhere between six weeks and five months. Some 60 to 70 percent of patients feel healthy and show no symptoms, yet the virus can be found in their blood and they produce antibodies later (Hollinger, 1985; Junge and Deinhardt, 1985). Others become very sick, first with low fever, loss of appetite, mild abdominal pain, aching joints, then progressing to jaundiced skin and eyes, dark urine, pain over the liver, weight loss, and sometimes depression (Hollinger, 1985). Most recover in 1 to 6 weeks, are no longer infectious, and remain immune for the rest of their lives (Thiel, 1988).

However, about 10 percent become chronic "carriers"—their blood and other secretions remain infectious throughout their lives (Hollinger and Melnick, 1985). About 5 percent get chronic active (fulminant) hepatitis, with severe liver damage, which may progress to liver failure and death (Junge and Deinhardt, 1985; Maugh, 1980). And chronic hepatitis seems to be a precursor to cancer of the liver (Beasley *et al.,* 1981; Maugh, 1980; Szmuness, 1978; Thiel, 1988).

If a pregnant woman gets hepatitis during the first or second trimester, apparently HBV does not cross the placenta (Junge and Deinhardt, 1985; Milne, 1986). However, women with acute hepatitis B late in pregnancy, or carriers with chronic hepatitis, readily infect their infants (Hollinger and Melnick, 1985). Probably transmission occurs during labor and delivery (Hollinger and Melnick, 1985; Junge and Deinhardt, 1985; Thiel, 1988). Babies infected during the perinatal period are very likely to get chronic hepatitis (Gerety and Tabor, 1985; Hollinger and Melnick, 1985; Thiel, 1988). Dijkzigt Hospital plans to give a vaccine to all the babies immediately after birth. Hyperimmune gamma globulin gives immediate (but temporary) protection and HBV vaccine

leads to permanent immunity (Seeff, 1985). Recent work at Shandong Medical University in China, where hepatitis B is endemic, has shown that vaccination of newborns can usually prevent the disease (Li *et al.,* 1986).

But the situation at Dijkzigt is unique: never before in the world have human eggs been fertilized and started development in the presence of active hepatitis virus (de Lange, 1988a). However, according to Dijkzigt Hospital's liver specialist, Dr. S. W. Schalm, an early embryo immersed in contaminated medium is not susceptible because HBV needs receptor sites which are found only on liver cells (Volkskrant, 1988b).

CLIENT REACTIONS

Reactions from Dutch women interested in IVF have run the entire gamut. Wieke Ver-meiden, secretary of the Netherlands Association for Test-tube Fertilization (NVRB, the Dutch IVF patient lobbying/advocacy group, with some 2200 members) said to the press:

> "Some exposed women have phoned to say that they're very relieved that IVF failed this time, for they wouldn't have known what to do if they'd gotten sick while pregnant. At Dijkzigt they say there's no danger to the unborn child, but they just don't know" (de Lange, 1988a).

She also criticized the carelessness of the Dijkzigt program. "I won't speak of laziness, but of course it's more efficient if you have a supply at hand and don't first have to tap off some blood whenever you make a culture medium" (deLange, 1988a).[5]

The NVRB urged the hospital to reimburse the women for damages; as a result on March 31 the hospital sent a letter to all the involved women informing them that, if they suffered injury from the exposure, they might submit a claim to the hospital's liability insurance company (Trouw, 1988a). Each claim will be considered individually.

Reporter Jan Bonjer of the Dutch daily *NRC Handelsblad* interviewed four of the hepatitis patients. First was a nurse from a northern province, who originally thought she had picked up hepatitis from a needle accident at work. In December a "deepfreeze embryo" had been inserted in her uterus in contaminated medium, a "spare" embryo from her failed first attempt in September. A third attempt in January also failed, "luckily," she said. When she heard about the hepatitis disaster, she immediately joined the NVRB. She plans to try for a fourth and last time once the virus is gone (Bonjer, 1988a).

A second patient, Mrs. Dekker of the central Netherlands city of Hilversum contracted hepatitis during her sixth unsuccessful attempt. Her first attempt was in Brussels, the second, in Vienna, and the next four, at Deaconess Hospital in Voorburg, a satellite hospital to the Dijkzigt program. Ovulation induction and egg retrieval take place at Deaconess, one of three satellites; fertilization, laboratory culture, and embryo transfer are carried out at Dijkzigt (Bonjer, 1988b).

Her attack of hepatitis forced her to cancel an appointment for a seventh attempt. When asked whether she would reschedule, Dekker said she would decide after the virus is completely out of her blood. Her husband is fed up with trying to get offspring via doctors and technicians, but she told Bonjer: "Every time we began again, I said: this is the last time. But after it's over you clutch at a new chance, just the same. After all, there are women for whom a seventh treatment succeeded. You're continually changing your limits" (Bonjer, 1988b).

A third interviewee, describing herself "yellow as curry," asked to remain anonymous. Three dogs and two cats ran about her flat, one obtained from the animal shelter after each failure. Before her first attempt she had a fallopian tube

operation and then wore a hormone pump for several months, to no avail. In two attempts, ovulation induction failed, once because ovarian cysts developed from the hormone injections. The other three times she reached the embryo transfer stage but did not become pregnant. On the fourth attempt she picked up the virus, but did not get sick until after IVF failed for the fifth time. Despite her rage about the error at Dijkzigt, she is going to keep on trying. "It *has* to work some time" (Bonjer, 1988b).

Mrs. Westerink of Leiden, the fourth hepatitis patient interviewed, called herself "four and a half weeks pregnant" after a third IVF attempt. Although she has two teenagers from a previous marriage, her fallopian tubes have not functioned since 1980 when she began to try to become pregnant with her current partner. After her second attempt in November 1987 when four frozen embryos were inserted, a short pregnancy miscarried early—and she was exposed to HBV (Bonjer, 1988b).

Reporter Henny de Lange from another daily, *Trouw,* interviewed a DES daughter who was an IVF candidate at one of the hepatitis-free Dutch IVF programs. A subscriber to *DES Action News* and a member of NVRB, she had had three ectopic pregnancies before four unsuccessful IVF attempts. "My longing for a child gets stronger and stronger."[6] About the accident at Dijkzigt, she said, "It is scandalous that such a terrible mistake can be made and not noticed for three months. I sympathize with those women and their partners." But she is going ahead with IVF. "In my opinion IVF is a normal medical treatment . . . You know that you run some risk. But that applies also if I have an operation on my big toe" (de Lange, 1988b).

Most interesting is the reaction of those women still awaiting treatment. Those who had started ovulation induction when the program was suspended in early March were furious at Alberda and Zeilmaker for stopping (de Lange, 1988a). They wanted just to keep on going, regardless. Not a single one of the 500-odd couples on the waiting list removed their names (de Lange, 1988a; Trouw, 1988b). Furthermore, during the week that it became known that 177 women had been exposed to HBV, the number of new couples who added their names to the list was the highest ever (Trouw, 1988b). The publicity about the HBV exposure had said that 38 of the 172 women had become pregnant (counting two early miscarriages in the 38). This misleading percentage (22 percent) apparently attracted previously hesitant infertile couples (Trouw, 1988b)[7]. However, the clinic did not reveal how many women started IVF during that 11-week stretch[1], nor even how many egg retrievals were attempted—necessary to calculate a meaningful success rate. Moreover, these early pregnancies still faced a 21 percent chance of miscarriage, the figure reported by Dijkzigt for 1986 (Zeilmaker *etal.,* 1987).

FEMINIST/ETHICAL ISSUES

1. Blood as resource

Modern medicine's attitude toward the use of blood is cavalier and inconsistent. On the one hand medicine gives it almost routinely to anyone who undergoes surgery or seemsto be losing blood. On the other hand, medicine taps it off from us routinely whenever we approach a physician with almost any problem.

These modern sorts of blood-letting have become so routine that no one thinks of asking permission for either "in" or "out." It takes a very assertive Jehovah's Witness to forbid the input of blood—and many hospitals may get court orders to put the blood in anyway. The "out," however, is at issue here: I'll mention just a few ethical problems. Blood may be removed for tests about the patient, for research, or to 'help' other people. A blood test is an invasion of privacy because so many personal matters about an individual can be learned that way. As for research, I

believe that one's blood ought not to be used in research unless the donor is convinced that the study is worthwhile and properly designed. And third, for treatment, as blood was used in the Dijkzigt IVF program, the donor has the right (maybe even the obligation) to let her blood be used only in a treatment that is both effective and ethical. I would want my blood to be used only in a life-or-death situation, to save someone's life, and second, I would not want to worry that something in my blood might make problems for another human being.

So, all the patients in the obstetrics clinic at Dijkzigt Hospital had blood taken from them—so routine that they probably did not even blink an eye. They never even knew what it was used for. Many blood samples were mixed together and centrifuged; after cells and fibrin clots were removed, there was serum to be shipped here and there, wherever someone thought it might be helpful.

The placenta is—in my opinion—another blood resource to medicine. Veeck of the Jones Institute told me that they have arranged with the general hospital's obstetrics suite to have placentas collected and delivered to the IVF embryology laboratory. The placenta belongs to the hospital, she claimed, not to the mother and infant who cooperated in creating it[8] (Veeck, personal communication).

2. Risks to workers

Handling blood contaminated with HBV poses risks to laboratory workers. Medical technologists are five times more likely to contract hepatitis than the general population (Gerety and Tabor, 1985), and contact with blood is more dangerous than contact with patients (Hollinger and Melnick, 1985). In his May press conference, Inspector Van Osch spoke of his concern that the technicians in the embryology laboratory were at risk during those 11 weeks. "A university laboratory is remote from patient care," he said. "The world of thoughts is something else. They talk about medical and ethical aspects, not safety" (Volkskrant, 1988c).

Further risks to nurses and lab technicians occurred during several steps of IVF with these infected women. Three of the four women whom Jan Bonjer interviewed already had contracted hepatitis when they went for their final IVF attempts. They were probably highly contagious at this point, for they got sick almost immediately afterwards. Their body fluids were hazardous: numerous blood and urine samples taken to monitor hormone levels for ovulation induction, follicular fluid removed with ova during laparoscopy, vaginal secretions during ultrasound monitoring and embryo transfer.

IVF team members undergo considerable stress and often get burnout at their jobs (Harris and Bond, 1987). Definitions of success have to be very optimistic (therefóre unreal) to keep up morale. Now there is risk of physical disease.

3. IVF as experiment

This hepatitis episode highlights the experimental nature of IVF. Doctors know this, although they declare the opposite when trying to get insurance payments to cover IVF. The American Fertility Society (1984) urges that its members take advantage of the opportunity to experiment while doing IVF. At the Jones Institute, the first sentence in their elaborate "informed consent" form states, "I understand that I am being asked to participate voluntarily in an approved research study . . . "(Acosta *et al.*, 1986).

Little is known about the efficacy of variants—proposed or tried—of each step of IVF. Indeed, a good clinical trial cannot be designed, first, because the etiology of each woman's infertility is different, and second, because each woman's body responds in an individual way to the various assaults on it. In fact, some infertile women become pregnant without treatment, even a few with blocked fallopian tubes (Collins *et al.,* 1983).

Nevertheless, vulnerable women—in no position to say "no"—are repeatedly being recruited for IVF-related experiments: women on waiting lists, women undergoing tubal ligation, IVF clients in mid-treatment (Bartels, 1988).

4. Control by third parties

The unpredictable hepatitis accident provides a clear example of how vulnerable to both the skill and the care of third parties are those couples who find themselves using artificial reproduction. Control is out of their hands from the moment they contract for the small chance of a baby.

Even the best trained and experienced people will make mistakes. In a team, also, one cannot be responsible for what other team members have done or will do later. One speculated laboratory error—especially in a lab that processes several couples at once—is the mixing of sperm from one couple with the eggs of another. Another is the replacement of the wrong couple's embryo. After all, even full term babies sometimes get mixed in a hospital after their births (one seldom-mentioned hazard of hospital delivery).

Here I am reminded of Peter Singer's analogy (1983). He compared infertility with nearsightedness. According to him, refusing to provide IVF (a palliative, not a cure) for infertile people—simply because feminists claim that one should instead prevent infertility—is comparable to refusing to provide glasses (also a palliative) for nearsighted people—because one should prevent nearsightedness. Of course this analogy is false for many reasons, two of them: procedures in measuring for glasses bring far less risk to the person's health than the preliminary-to-baby procedures in IVF; and success in making glasses is very close to 100 percent.

But the eyeglasses analogy can be instructive in other ways. For we are indeed vulnerable to the skill and care of the technicians who grind the lenses for our glasses. Now, suppose they make a tiny mistake—grind the lenses slightly wrong or give us the prescription of someone whose impaired sight is somewhat like ours. The glasses might seem a little strange to us, but we would pay for them and later keep saying to our friends, "I'm still getting used to my new glasses." However, if a big mistake were made—if we could no longer see the road signs when driving—we would return the glasses and demand our money back.

Similarly, small mixups in an IVF laboratory would go unnoticed. If the physical characteristics of the males were similar, one would not notice anything in a baby conceived with the sperm of a nonpartner male. Distinctive family physical traits usually show up only as the child grows older. I was immediately struck, when I first saw a photo of a cohort of Australian IVF toddlers, by how much they looked alike. I speculated that IVF clients in Australia must tend to belong to the same ethnic group. Perhaps their fertile friends and neighbors do a bit of "sleeping around?" So why should the exact parentage of an IVF child matter?

Again, suppose a petri dish falls off the shelf and breaks? A petri dish with the eggs of a client on her third attempt, now vomiting uncontrollably in the recovery room? Suppose further that the next petri dish has more than the three eggs which your clinic's rules allow you to replace. If everyone comes from the same ethnic group, does it really matter whose sperm goes with which egg? The client will never know. A "child of one's own"? The neighbors who are sleeping around also claim to have children of their own. As geneticists who try to trace genes in family trees know only too well, it is a wise child who knows its own father[9].

In sum, sloppiness and carelessness in an IVF laboratory in some cases may be undetectable, perhaps even hidden from the program directors. As assessors of this technology we may never be able to document such matters. On the other hand, something like the hepatitis exposure is impossible to cover up.

Hepatitis is a serious disease that must be reported to public health authorities; all those exposed must be contacted and vaccinated. The Dutch reporters who hang around the Dijkzigt Hospital would not have missed this event. Therefore, the hospital directorate, with Zeilmaker and Alberda present, held a press conference on March 7, 1988. Then, on May 2, Inspector Van Osch formally reported the results of his investigation to the press (Volkskrant, 1988c).

CONCLUSION

This hepatitis accident, unique though it may be, provides an excellent concrete example of the vulnerability of couples who contract with third parties for the production of their offspring. It highlights the experimental nature of the IVF, the, "hey, what-shall-we-try-next" hocus-pocus, and the gambling, risk-taking behavior that it tends to foster.

Acknowledgments—I am grateful to Tjeerd Tymstra and Anita Direcks for keeping me informed about details of the hepatitis accident in spring 1988.

ENDNOTES

1. The number 264 is my estimate, calculated from data published the previous year at Dijkzigt Hospital (Alberda *et al.,* 1987). Fifteen percent of women who have egg retrieval fail to go on to the embryo transfer (ET) stage: thus, to have 172 at ET, about 202 must have had eggs retrieved. Then, 23.4 percent of the women who get hormone shots for ovulation induction are canceled before egg retrieval: thus, for 202 with egg retrieval, approximately 264 must have started.

2. Hocus-pocus has been explicitly put to the test in one IVF laboratory. In Calgary, Alberta, the IVF team had 7 pregnancies after 75 embryo transfers (9.3%) until they placed a Cook Island silver dollar, bearing the symbol of a fertility god, on the sterile hood in their laboratory. *Then* they had 10 pregnancies from only 45 transfers (22.2%). They correctly conclude: ". . . there are so many variables contributing to success or failure in IVF, any conclusions drawn from similar apparently single variable studies must be read with caution" (Taylor *et al.,* 1986).

3. IVF has been used when husbands of fertile women have such poor semen that pregnancy cannot become established through intercourse. Laboratory fertilization can be achieved with a lower sperm count and fewer active sperm, but the poorer the sperm, of course, the lower the rate of fertilization (Cohen *et al.,* 1985; Yovich and Stanger, 1984).

4. DES (diethylstilbestrol) is an estrogen derivative that was given, starting in the 1950s, hocus-pocus, with out previous careful testing, to pregnant women in an attempt to prevent miscarriages. It caused reproductive tract defects—which were, not evident until puberty—in many of the sons and daughters carried in those pregnancies, as well as a higher chance of breast cancer 20 to 30 years later in the mothers. Daughters may have abnormally shaped uteruses; some have "clear cell" cancer of the vagina (Direcks, 1987; Direcks and Holmes, 1986).

5. The change in viewpoint of the NVRB is instructive. In 1984 and 85, they lobbied for more and more IVF clinics throughout The Netherlands; now they advocate fewer clinics with stricter quality control.

6. Watching history repeat itself in DES daughters is chilling. Doctors gave their mothers, the untested, ineffective medication DES; now the daughters, infertile because of that very DES, are determined to have children, and expose themselves to the multiple risks of IVF (Diercks, 1987; Direcks and Holmes, 1986).

7. In our 1985 survey of IVF clients in The Netherlands (Holmes and Tymstra, 1987), 79 percent said they would undergo IVF to help doctors gain experience, even with no chance of getting a baby. In early 1986, de Zoeten *et al.* (1987) found that 61 percent of 83 women on the Dijkzigt Hospital IVF waiting list would try IVF even if the chance of success were as low as 2 percent. Presumably, there are couples who would want the odds to be better, who could not have been reached in these surveys because they had not yet signed up.

8. It is a Maori custom to bury a placenta and then plant a tree over it which will be that child's tree for life. In my opinion, this so-called primitive practice honors the joint creation of mother and child far better than extracting its blood for laboratory manipulations.

9. It is ironic when the motivation for IVF is often a driving desire to pass on one's own genes, that the many third parties participating in the laboratory steps can so easily (accidentally, or to solve a problem of missing or nonviable eggs or sperm) mix things up.

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