Conceiving contraceptives: the involvement of users in anti-fertility vaccines development
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Citation for published version (APA):

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Chapter 2

Representing users’ bodies

1. Introduction

In the process of setting the agenda for anti-fertility vaccine research and development that I have described, users were involved by means of the implicit and explicit images of prospective users that were envisioned by the member states of the WHO, biomedical scientists, and social scientists. The eventual target group for immunological contraceptives was conveniently kept vague: the method would be for everybody. This indetermination of the envisioned users included their sex. The fact that anti-fertility vaccines could be developed for either male or female users was repeatedly emphasised by scientists and policy makers in the field of immunocontraception. In this chapter I will examine why, in spite of the constant reiteration that immunological methods for both sexes could be developed, most work has been done to develop a vaccine to be used by women. For this purpose, I will explore how representations of users were involved in the next stage of the development of immunological contraceptives: the selection of appropriate substances against which people could be immunized for the purpose of regulating their fertility.

Akrich’s studies (1992, 1995) show that innovators were very interested in the future users of their product from the beginning. But are technology developers always interested in their future users? Or are they just concerned with such matters as resolving their technical problems and making the artefact work? As I have argued in the Introduction, even if innovators do not always have users in mind, we cannot conclude from this that users don’t matter. The technical trade-offs that the innovators make in the earliest stages of technology development have consequences for who might use the artefact, and how. Therefore, the absence of articulated ideas about future users highlights the need to focus on the ways in which users are implicated in technology development.1

How were ideas about future users involved in the initial research of the biomedical scientists? In order to select an antigen and develop an anti-fertility vaccine, biomedical researchers needed a representation of their
object of intervention: the users’ body. Users’ bodies are of paramount importance in the development of medical technologies. Therefore, in the first part of this chapter I will analyze the provenance of representations of users’ bodies that were brought into the process of defining opportunities for immunocontraception. In the emerging field of reproductive immunology, a wide variety of representations of users’ bodies was possible. How did all the different scientists agree upon a particular representation of users’ bodies, and what did this body look like? In this chapter I will answer these questions by focusing on the disciplinary backgrounds of the scientists who became involved in the research on anti-fertility vaccines. The newly formed Task Force on Immunological Methods for Fertility Regulation of the World Health Organization enrolled scientists from different disciplinary backgrounds in its attempts to develop anti-fertility vaccines. According to Richard Whitley, scientists belonging to the same discipline share a general approach to the analysis of similar issues. This is called disciplinary styles, and refers to a coinciding conceptual framework for defining problems and solutions and for preferring certain methods and techniques (Whitley 1974). The concept of disciplinary styles encompasses both discursive and material elements of scientific approaches. I suggest that it is useful for understanding the contribution of reproductive biologists, immunologists, and clinicians in reaching agreement upon a representation of users’ bodies.

But studying representations of users’ bodies, the disciplinary styles from which they arose, and the ways in which they were made to align, is not sufficient for understanding the development of anti-fertility vaccines with a particular script. Although a whole range of possibilities were depicted, only a few types of anti-fertility vaccines were actually developed. How, then, can we understand this narrowing down to a few particular types of vaccines? The ability of researchers to generate representations of users and to integrate these into their technical choices is not merely contingent. The range of possibilities is both enabled and constrained by specific (inter)national or institutional policies, and by material practices that have evolved over years of doing reproductive science. The extent of the researchers’ room for manoeuvre to develop certain technologies and not others will be explored in the second half of this chapter. A gendered pre-existing infrastructure characterized the field of the reproductive sciences, and this had important consequences for which types of vaccines would be developed and which not.

2. Setting the stage for an accessible body

In 1972, the World Health Organization in Geneva took the lead in research and development of anti-fertility vaccines by establishing a Task
Force on Immunological Methods for Fertility Regulation. One of the first activities of this Task Force was to organize a symposium in 1974 in which sixty prominent reproductive biologists, immunologists, and clinicians from fifteen countries came together to discuss the prospects of immuncontraception (Diczfalusy 1975). Each discipline favored its own particular approach to the question of how immunological contraceptives could be developed, and the meeting was an occasion to debate their views and proposals. Which representations of users' bodies emerged from each of these approaches?

**Clinicians: mobilizing nature's experiments**

At the symposium, the clinicians argued that immunization against fertility was likely to be possible, because part of naturally occurring infertility in otherwise completely healthy persons is due to immunological factors (Diczfalusy, 1975). This experience in the treatment and study of infertility guided the clinicians in devising immunocontraception. Their approach consisted in taking serum from women patients with infertility who visited their clinics, and trying to identify the implicated antibodies.¹ The Australian clinician Warren Jones had tested several methods for the detection of anti-sperm antibodies in the sera of women with infertility (Jones 1975, 376-401). Jones presented his work at the 1974 symposium. He was readily invited to participate in the Steering Committee of the WHO's Task Force on Immunological Methods for Fertility Regulation.

From the analogy with naturally occurring infertility, the clinicians considered anti-fertility vaccines development as mimicking the so-called "experiments of nature". The notion of mimicking nature's experiments was gratefully adopted by the scientific community involved in vaccine development, and facilitated making anti-fertility vaccines conceivable.² As the Indian scientist Pran Talwar wrote in a review article:

> Is it possible to prevent fertility immunologically? The answer to this question has been provided by nature's experiments. (...) Although the way in which immunologic response developed in the infertile patients is not clear, the very fact of its existence indicates that it is producible (Talwar 1979, 62).

Also adopted from the parallel with infertility research was a certain representation of future users. Infertility has traditionally been located, investigated, and treated in the female body, and the clinicians - or more precisely: gynecologists - encountered women in their clinics (Pfeffer 1985, Oudshoorn 1994, van der Ploeg 1995). Anti-sperm antibodies were also found in men with infertility. But research into the immunological variety of infertility had
mostly been done in women. As two American researchers wrote in a review article:

That reproductive processes in women are vulnerable to immunologic intervention has been best documented by the numerous reports of natural infertility in women with anti-sperm antibodies and anti zona pellucida antibodies (Anderson and Alexander 1983, 566).

The experience of gynecologists in the field of infertility pointed to the female body as the natural site for intervention. The representation of users' bodies that these clinicians adopted with this practice was that of the infertile woman.\(^3\)

**Immunologists: women's permeable bodies**

The way in which the clinicians had made anti-fertility vaccines thinkable, by detecting antibodies against sperm in women, fitted the immunologists' common-sense intuition as well as their practical traditions. According to immunologists, any substance that was not part of the self would be recognized by the immune system and elicit an immune response. Therefore, that the sperm and the fetus, which are immunologically foreign to a woman, should be tolerated in the womb was (and to a certain extent still is) highly problematic for immunologists. It was precisely in this immature area of immunology that anti-fertility vaccines were intended to act. The immunologists were ambivalent about the development of anti-fertility vaccines. On the one hand, studying the effects on fertility of antibodies against specific antigens was clearly within their domain. On the other hand, the reproductive processes in women violated their paradigmatic self/non-self boundary. As one of the immunologists commented:

There is no need to emphasize either the importance of the ultimate goal - the control of fertility - or the difficulty of assessing the possible contribution of immunology to that goal (Celada 1975, 419).

The concept of anti-fertility vaccines, at the intersection of immunology and reproduction, was closely linked to a major theoretical problem in immunology. But in the practical realm there were glimmers of hope. Since sperm and placental extracts are relatively easily available, experiments to study the formation of antibodies by injecting these substances had been carried on since the turn of the century.\(^4\) Immunologists could therefore rely on some experience with immunological techniques using these substances.

The immunologists supported research into interference with sperm and with the placenta, both in the female body, as the most promising approach to anti-fertility vaccine development. These substances which, moreover, they
knew how to handle, were not unambiguously part of the immunological self. Sperm was obviously foreign to a woman, and its transient presence was predominantly restricted to her reproductive tract. The placental hormone hCG did circulate in a woman’s blood stream after conception had taken place, but it was produced by a not completely self-structure: the fertilized ovum. Therefore, only sperm and placental antigens in women were acceptable targets for the immunologists, since they could be categorized as non-self and thus fit into the existing immunological paradigm. As Voisin stated at the symposium:

I think that all immunologists in the audience agree that immunization against an antigen pertaining to an organism must be expected to lead to dangerous consequences (...) The only way to have some means that would not be expected to lead to dangerous consequences is to immunize against a substance that is not part of the body. The only two types of such substances are coming from the placenta or, rather, from spermatozoa that have a short lifetime in the female body (in Diczfalusy 1975, 35).

This was a fascinating manoeuvre: the immunological discomfort with women’s reproductive bodies was made into a virtue for anti-fertility vaccine development. The immunologists’ inability to explain the occurrence of pregnancy became their logic to prevent it. Placental substances and sperm in a woman’s body were considered appropriate targets because of their ambiguous state in terms of the immunological selfness of females.

What did this mean for the representation of users’ bodies that circulated amongst immunologists? Their representation of possible future users of the new method had been women with problematically ill-defined body boundaries in the field of reproduction. Now, body boundaries were reinterpreted as being permeable, as admitting non-self, and thus permitting immunocontraceptive intervention in women.

Reproductive biologists: the chain of reproductive events

Reproductive biologists did not yet have specific practices for developing anti-fertility vaccines, but they had a long-standing tradition in the pursuit of reproductive science. For these scientists, anti-fertility vaccines provided a new opportunity for doing reproductive research. They began by summing up the steps in the human reproductive process. According to the reproductive biologists, each of the following steps was in principle susceptible to intervention:

spermatogenesis, epididymal sperm maturation, ovulation and the menstrual cycle, sperm transport in the female organism, capacitation,
fertilization, tubal transport of the fertilized ovum, implantation and early embryonic development (Diczfalussy 1975, 13).

The reproductive biologists represented their object of contraceptive intervention as a chain of reproductive events with two steps localized in the male and seven in the female body. Each of these steps could perhaps be intercepted immunologically. Because it was not bound by the immunological self/non-self paradigm, their representation greatly extended the number of possible sites of immunointerference, and thereby the number of possible research leads. In the first chapter I discussed the analysis by the American sociologist Adele Clarke (1998) of the strategies that reproductive scientists had used to maintain their professional autonomy vis-à-vis the world of family planning while at the same time gaining support and funding. In particular, they had insisted upon distinguishing research into contraception, associated with sexuality and the socially illegitimate birth control movement, from the more decent and scientific research into human reproduction. And they had insisted that the study of human reproduction should include basic research (Clarke 1998). It is within this framework that we can understand the emergence of the reproductive biologists' representation of users' bodies. An all too explicit representation of contraceptive users' bodies was displaced by a suitable object of intervention for the reproductive sciences: a chain of steps. This representation of users' bodies, in addition, entailed an extension of opportunities for immunointerception, and thereby of possible research leads. Notably, the strategy of extension could only work because users' bodies were represented in this particular way. For other thinkable representations of users' bodies (for example as occurring in a variety of socio-economic and personal settings or as experiencing a range of different meanings of family planning) increasing the number of possible research leads might not have been an attractive option, as this would have added to the complexity, deferring the thinkability of a quick and universal technological fix for fertility control. Representing users' bodies in terms of steps in the reproductive process was a very effective strategy in gaining support for a wide range of research in reproductive science.

In sum, on the basis of their specific material and cognitive resources, each discipline preferred a different approach to developing anti-fertility vaccines, and their approaches were accompanied by different, gendered representations of users' bodies. The clinicians viewed future users through an analogy with their infertile patients. Therefore, male users were not explicitly excluded, but in accord with the pre-existing gynecological infrastructure, female users received more emphasis. In the conceptualization of the immunologists, women's reproductive bodies could possibly respond to immunological intervention. Male users were inconceivable for them, as their
bodies did not contain foreign target substances. For the reproductive biologists, both male and female bodies were involved in reproduction and were therefore in principle amenable to intervention.

2.1 Negotiating male body boundaries

According to the reproductive biologists' representation of users' bodies, immunological contraceptives could potentially be developed for either men or women. But if the criteria of the immunologists for the selection of antigens were upheld, male bodies were at risk of disappearing completely. It was the American reproductive biologist Vernon Stevens who explicitly articulated the issue of male or female users. As the originator and protagonist of the most promising approach to the female body (see chapter 1), Stevens was beyond suspicion of merely speaking on behalf of his own interests in developing a method for men. During one of the first discussions at the symposium, he said:

If this position is adopted and followed by the investigators in the field, i.e. the prohibition of using any self-antigen as an approach to immunological fertility control, then does anyone have any suggestion for attempts to establish a male immunological fertility control method? As far as I can determine, this excludes the male (in Diczfalusy 1975, 35).

In an apparent attempt not to surrender the extensive range of steps that he and other reproductive biologists had proposed, Stevens brought male users back onto the stage. But the selfness of male bodies had never been called into question by immunology. How could the steps in the male reproductive body be rendered susceptible to immunological interference? The reproductive biologist Erwin Goldberg, who had been working on an anti-sperm antigen, reasoned that sperm could be envisioned as foreign to males as well: sperm is sequestered from the immune system by one of the toughest barriers of the body, the blood-testis barrier. Therefore, Goldberg reasoned, molecules of sperm could be a target in male as well as female bodies:

The logical basis for such experimentation derives from two primary considerations. In the first place, spermatozoa are cells foreign to the female. Therefore, any unique macromolecule constituents of sperm would be expected to induce antibody formation which, in turn, could be followed by reduced fertility. (...) Similarly, in the male the germinal epithelium is isolated from the body's immune system, presumably by the blood-testis barrier. This suggests that antibody formation could be provoked by sperm specific proteins (Goldberg 1975, 203).
In addition, it was argued that spermatozoa could be considered foreign to the male immune system because their production starts at puberty. Sperm could therefore bear molecules which had not been ‘seen’ by the immune system when built up in the fetal stage, and could therefore be recognized as ‘foreign’:

After realizing (...) that the immune system will exercise by acting only on late developing antigens to which the body is not tolerant but not to the rest treated as ‘self’, our group has of late become interested in devising new ways and means of harnessing the autopotential against sperm antigens to achieve aspermatogenesis (Talwar 1979, 66).

The immunologists and clinicians had first rendered women’s reproductive bodies susceptible to immunological interference with fertility. Subsequently, the reproductive biologists successfully challenged the immunological selfishness of the male reproductive body. The immunologists did not have to cede their criteria that less-self substances were more appropriate for the development of harmless immunological contraceptives. Instead, men’s reproductive bodies were redefined as being not completely immunological selves. Now male bodies were endowed with the same ambiguity as female bodies. This redefinition of male body boundaries meant that men could become conceivable as users of immunological contraception.

Note that the means by which male users were made conceivable are historically specific. Anti-sperm antigens were portrayed as having an "autopotential" for achieving something in the male. This stands in remarkable contrast to the way in which the female body was represented, as vulnerable to immunological interference. The redefinition of the male body did not contradict the ancient dichotomy: in contrast to the female reproductive body, the drastically reinterpreted male body did not lose its capabilities.

2.2 A cascade of target substances

The researchers involved had to reach agreement about the possibilities for immunointerception. Their common understanding of the site where immuncontraception would work was reflected in scientific papers as a picture. The researchers found their greatest common denominator in representing users’ bodies as a cascade of target substances. The reproductive immunological body that emerged from this fusion of the reproductive biologists’ and immunologists’ bodily representations was made possible by its articulation through target substances. All the steps in the human reproductive process proposed by reproductive biologists were now presented in
immunological terms: as possible antigens or target substances. As Jones wrote:

For the purposes of fertility control, immunological influences may be brought to bear most logically on the stages of the human reproductive process up to and including implantation (Fig. 1.1).

Once this simplified representation of users' bodies as a cascade of opportunities was established, all possible target substances could be added to the figure without seriously affecting its elegance. The opportunities for immunological interference were further extended to include the pituitary and hypothalamus hormones involved in the production of sperm, ova, and sex steroids, i.e. LHRH, LH, and FSH. LHRH from the hypothalamus regulates the synthesis and release of the pituitary hormones, LH and FSH, in both male and female bodies. LH and FSH control spermatogenesis and the production of testosterone in men, and of estrogen and progesterone and follicular development in women.

Scientists inevitably have to simplify and select what is considered relevant and important for their work. The convenience of this specific representation of users' bodies in terms of target substances can be understood as the result of two dynamics: the merging of disciplinary styles, and the propensity of scientists to extend rather than limit their possibilities for exploring new research leads. Various scholars who have studied representational activity in science have emphasized the importance of visual depic-
tions (Lynch and Woolgar 1990, Fyfe and Law 1988, Beaulieu 2000). The scheme that they proposed was not "just a picture". The centrality of target substances has become firmly anchored in research practices. Target substances have been a structuring factor in research on immunological contraceptives. The 1974 program of the WHO Task Force on Immunological Methods for Fertility Regulation was organized in terms of target substances (Diczfalusy 1975). Subsequent meetings and review articles classified the developmental work on anti-fertility vaccines by target substance. Target substances also informed the way in which the scientists involved referred to each other. For example:

(jvk: Who, in your view, are the other main researchers?) Well, in the zona pellucida thing there is A, and B and C. And at the sperm side there is D, who works with E, he is also a sperm fellow (interview with Stevens 1:43-44).

The representation of users' bodies as a cascade of target substances was adopted by the major actors in the field, including the team under the direction of Pran Talwar at the National Institute for Immunology in New Delhi, and the research carried out under the auspices of the World Health Organization (Talwar 1979, 64; Gupta and Koothan 1990, 48; WHO/HRP 1993, 12; Talwar et al. 1993, 208). The captions that accompanied this depiction indicated "possible points of intervention to prevent pregnancy" (WHO/HRP 1993, 12) and "possible sites of immunointervention" (Gupta and Koothan 1990, 48), suggesting that from the picture we can learn where the interventions will be located.

Of course, processes of selection and simplification are never neutral (Star, 1992; Law and Whittaker, 1988). Simplification of what would otherwise be unworkable complexity implies at the same time a process of production of new objects and relations. In emphasizing or making visible certain elements and setting aside as trivial other parts of the scientific object and endeavor, some elements get lost. Apparently, in the representation of opportunities for the immunological interception of fertility, recognizing the boundaries of what once used to constitute male and female bodies was not necessary, or even meaningful. In this representation, the distinction between the bodies of male and female users had disappeared completely. In the schematic outline, testes and ovaries are grouped together under the heading gonads and depicted as producing gametes and sex steroids, undifferentiated by sex. The bifurcation between sperm and ovum is depicted in the same way as that between FSH and LH, substances that occur in both bodies. A body with a sex seems to be implicit as a source of target substances: the ovum and the early embryo occur only in women. But the sex of the body of who might use the vaccine is absent. This is an intriguing finding. As against the intuitive notion that the sex of bodies might be more central to reproductive
science than to any other science, it seems to be irrelevant to the scientists involved.

Thus far I have shown how the scientific community involved in the research and development of anti-fertility vaccines constructed a common representation of users' bodies. The opportunities of the scientific community in making this representation were defined by their disciplinary styles, their access to material and cognitive resources, and their willingness to further the enterprise of developing anti-fertility vaccines. This work to reach agreement on where the vaccines might act was crucial in developing the prospect of immunological contraception. However, the emergence of the representation of reproductive immunological bodies outlined here cannot reveal the whole story. The scientists had reiterated all the time that anti-fertility vaccines could be made for both males and females. They worked hard to include the bodies of male users, and they depicted a sexless cascade of possible sites of intervention. One would rather expect that now a vaccine to be used by either men or women could be made. This was not the case, however. The representation of users as either male or female was not inscribed in the artefact that they developed. Instead, a technology with a clearly gendered script evolved. The overwhelming majority of the work on anti-fertility vaccines is aimed at women. Why? What can account for the asymmetric presence of male and female users' bodies in anti-fertility vaccines research and development? For example, how did the development of an anti-hCG vaccine become and continue to be the most advanced line of research? Why are anti-sperm vaccines mostly developed for women? And how could some research on male immunocontraception still be carried on? To answer these questions I will now turn towards the research practices in which anti-fertility vaccines were developed against certain substances and not against others.

3. Selecting proper target substances

3.1 The availability of hCG

The availability of a substance was a very important criterion in selecting appropriate antigens. The placental hormone hCG satisfied the availability criteria (WHO/HRP 1973, 23). In the early 1970s, when research on anti-fertility vaccines began, hCG was also used in the treatment of infertility. Therefore the WHO's principal investigator, Stevens at Ohio State University, could obtain purified hCG from companies that collected pregnancy urine for this purpose (interview with Stevens 2;3). Also for Talwar and his group at the National Institute of Immunology in New Delhi, the plentiful availability of hCG in family planning clinics was a consideration in focusing
on its derivatives (Talwar 1976, 129). The hormone hCG was embedded in the gynecological infrastructure, which contributed to its becoming a favorite target substance in the early developmental stage of the vaccine in the 1970s. The notion of a gynecological infrastructure was introduced by Oudshoorn (1991), who has analyzed how the availability of research methods and materials for female sex hormones, and the existence of a powerful institutional context of gynecological clinics for the reproductive functions of the female body, resulted in the making of hormonal drugs for women but not for men. The absence of such a network in the field of male reproduction in part accounts for the lack of success in developing male hormonal drugs. The successful development of hormonal contraceptives further strengthened the gynecologists’ networks in contraceptive development (Oudshoorn 1991, 127-172). As a consequence of this asymmetry in the institutionalization of male and female reproduction, target substances in women were more likely to circulate and be available in reproduction research than those in men. The convenient availability of abundant quantities of hCG was an advantage. In the 1978 Annual Report of the WHO:

Other lines [than hCG, jvk] which continue to show promise but which are pursued at a lower intensity include vaccines based on sperm antigens and antigens of the zona pellucida. Several lines have been discontinued during the past year either as the result of disappointing data being obtained regarding anti-fertility efficacy or because of technical problems preventing sufficient quantities of material being prepared for initial evaluation (WHO/HRP/AR 1978, 99).

3.2 "Politically correct targets"

The appropriateness of the antigen hCG was also conditioned by specific moral and political cultures. HCG is produced by the fertilized ovum and vaccines based on hCG could be considered abortifacient. In an article reviewing different vaccine candidates, two American researchers commented: Physicians introducing large scale contraceptive vaccination programs should be sensitive to the ethical and moral views of the population. HCG vaccines and other early abortifacient will not be accepted by many societies. (...) Because of the convenience of vaccines and the need for improved methods of birth control, many people will accept a safe contraceptive vaccine that interferes solely with prefertilization reproductive processes (Anderson and Alexander 1983, 568).

While the medical definition states that pregnancy begins only after implantation, U.S. policy was guided by the notion that fertilization is the key moment. In the Reagan era, funding for population programs were cut and
special mandates were initiated to prevent the principal U.S. government funding agencies, the National Institutes of Health (NIH) and the Agency for International Development (USAID), from funding this research (Djerassi 1989, 358; Roush 1994, 1165). As Nancy Alexander, who had become head of the contraceptive development branch of the U.S. National Institute of Child Health and Human Development of the NIH (NICHD/NIH), said of the hCG vaccine:

"Our Congress would think of it as an abortifacient." (Alexander, quoted in Aldous, 1994).

These politics profoundly affected the research of the U.S. Population Council. The Population Council’s International Committee for Contraception Research had joined the work of Talwar and his team at the National Institute of Immunology in New Delhi on the development of an hCG-based vaccine and invested many years of work in this effort. Encouraged by the results of Talwar’s clinical trial with four women in 1974, investigators under the auspices of the Population Council carried out phase I clinical trials with a similar preparation in Sweden, Finland, Chile, and Brazil in the period 1976 to 1980 (Nash et al. 1980, 329). In 1986, the ICCR of the Population Council initiated an additional phase I clinical trial in Finland, Chile, and the Dominican Republic (Brache et al. 1992, 2). In 1991 a representative of the Population Council reported to the meeting of the Steering Committee of the WHO/HRP that

Although plans had been made to carry out a phase II clinical trial with this vaccine, lack of funds and lack of interest by two of the three centers, which are predominantly Catholic countries, have led to a delay in initiating this study (SC minutes 1991, 25).

Their effort to develop an anti-hCG vaccine diminished and finally stopped completely in the course of 1994. The strong political opposition against abortion-related technology in the United States was a major reason to redirect their research program. As the former director of the Contraceptive Development Programme of Population Council, Rosemarie Thau, said in an interview:

I could not get funds for the hCG vaccine. The government considered it as an abortifacient, because it works probably after fertilization. But I could get money for the LHRH vaccine, so this also influences it (interview with Thau 1993;12).

Also for the pharmaceutical industry, the extent of abortion-relatedness was a factor in selecting a target substance for anti-fertility vaccine development. According to Stevens:
A long time ago, two scientists [from the Dutch pharmaceutical company Organon, jvk] visited here for two or three days. And they were enthusiastic about the data, went back and made very positive recommendations for Organon. But then we got up to the top level and they considered these sociological factors and said: we can't do it. They have been supporting research at the University of Edinburgh though, developing a vaccine against the zona pellucida antigens (interview with Stevens 1:31-32).

On the other hand, the WHO/HRP, committed to the avoidance of duplication of efforts, persistently carried on its work on hCG. The WHO and the Task Force researchers used a twofold strategy to justify the political acceptability of their option. First, they pointed out that the mechanism of action of the hCG vaccine, especially the precise moment of its activity, had not yet been determined. The vaccine therefore could be portrayed as a "peri-implantation" method (Stevens 1990, 347; Dirnhofer et al. 1993; Benangian 1994). Second, the researchers emphasized that, independently of the mechanism of action, menstrual bleeding would appear around the expected time. Therefore, women wouldn't even notice the difference between normal menstruation and an immunologically intercepted fertile cycle (Jones et al. 1988, 1295; Griffin and Jones 1991, 178; Griffin 1992, 169; Griffin, Jones and Stevens 1994, 71; Griffin 1994, 89). Historically, the maintenance of menstrual regularity has been a major motive in developing new contraceptive methods. Since there was a great deal of agreement on the significance of not disturbing menstrual patterns, emphasizing its maintenance was appropriate for asserting the methods' acceptability. The development of an hCG vaccine had started some years earlier than research on other antigens. It had gained momentum and maintained an advantage over the other research leads of the WHO/HRP (interview with Griffin 1:38). However, Task Force researcher Stevens was essentially excluded from receiving NIH financial support due to political pressure from lobbyists to deny government funding to anyone associated with abortion-related research (Stevens, personal communication 1 July 1997). The Australian gynaecologist Warren Jones, who under the auspices of the WHO conducted a clinical trial with anti-hCG vaccine in 1986-1987, also received abusive letters from anti-abortion lobbyists. Questions about the precise mechanism of action of the anti-hCG vaccine were asked in the Australian Senate in October 1987 (Minutes Estimate Committee D 1987, 58-59).

For the research team at the National Institute of Immunology in India, where abortion was legalized in 1976, the abortion-relatedness of their research into anti-fertility vaccines never seems to have been an issue (Kalpana Viswanath, personal communication 16 December 1996).
3.3 ‘Androgyn’ antigens

For the U.S.-based researchers who depended on U.S. funding, developing an anti-hCG vaccine was no longer an option. They therefore turned towards the politically impeccable pre-fertilization antigens, such as molecules of sperm and the outer layer of the ovum, the zona pellucida. In 1986, the American National Institute of Health began to fund applied research on pre-fertilization immuncontraception. Grants and contracts were awarded to two consortia of collaborating university-based scientists in the United States working on zona pellucida antigens and on various sperm antigens (McClure, 1994).

Like hCG, ovum antigens occur only in women; but vaccines based on sperm antigens could be a target substance in both sexes. This was repeatedly stressed by the researchers involved:

Sperm antigens comprise one possibility for both males and females, as they are present only transiently in the female reproductive tract and are sequestered in the male, where their expression is restricted to testicular germ cells and sperm (Jones, Ada and Basten 1985, 289).

Compared with anti-egg or anti-fetus immuncontraception, an anti-sperm vaccine has two theoretical advantages. First it would work in both males and females; second, it would not raise problems of auto-immunity in the female if a sperm-specific protein is used (Isahakia and Bambra 1992, 118).

A promising approach for a contraceptive vaccine is to use a sperm protein as immunogen and to develop a vaccine for either men or women. The idea is that the vaccine would act to block some required sperm function and thus induce infertility (Primakoff 1994, 208).

Sperm antigens thus gave rise to a representation of users’ bodies that fitted the visual depiction that the involved scientists had assembled: as either male or female. That anti-sperm vaccines could be developed for either men or women was portrayed as an attractive feature by the researchers. But the undifferentiated sex of future users of anti-sperm vaccines envisioned by the researchers did not coincide with their practice: most anti-sperm vaccines are developed for women. The ‘androgyneity’ of these antigens makes it possible to explore how research practices shaped the choice of male or female users.

The development of modern molecular biological techniques in the mid-1980s changed the availability of potential target substances. This was especially relevant to sperm antigens: earlier, only abundant components of sperm could be tested, but now antigens that were short-lived or scarce could
also be studied (Naz, Alexander, and Isahakia 1984, 342; Griffin 1991, 171; Primakoff 1994, 210). From the early 1980s on, several laboratories developed monoclonal antibodies to define and characterize a whole range of different sperm antigens which could be made available and studied for contraceptive purposes (Anderson and Alexander 1983, 561; Talwar and Gaur 1987, 1077; Naz 1990, 748).\(^{17}\)

To be appropriate for either male or female contraception, the sperm antigen must be located on the surface of the sperm cell and not inside. Only sperm surface antigens could actually be developed into a vaccine for users of either sex. In researchers' texts on the biochemical work of identification and chemical characterization of sperm surface antigens, the sex of future users of an eventual vaccine based on that antigen is not discernible. Nor is there any mention of the sex of future users in research on the tissue specificity of the antigen. Its role in fertilization is also studied in isolation from male or female bodies: the extent to which antibodies against a certain antigen inhibited fertilization could be studied in *in vitro* experiments (Naz 1988, Primakoff *et al.* 1988, McClure 1994, Griffin and Hendrickx 1989). The first bodies to appear in the research reports were those of laboratory animals. What difference did the sex of test animals make?

Two antigens on the surface of sperm - and therefore potentially a basis for both male and female methods - seemed promising: FA-1 and PH-20. FA-1 was found by the NIH-supported research team of Rajesh Naz at the Albert Einstein College of Medicine in New York. They conducted tests in female rabbits and male mice. In female rabbits they found a significant reduction of fertility after immunization with FA-1. The male mice experiments were also encouraging. The researchers then commented:

These results, using FA-1 as a model antigen, indicate that an anti-sperm contraceptive vaccine may be effective in both males and females. In males, it will act by binding to spermatozoa in epididymis and vas deferens, probably without percolating into the testes. Once bound, the antibodies can show their effects at the time of fertilization in the female genital tract (Naz and Menge 1990, 512-513).

That antibodies did not percolate into the testes was important to avoid problems of autoimmune testicular inflammation, called orchitis. Naz and his colleagues found additional evidence of the possible safety and efficacy of FA-1-based vaccines in the involvement of the antigen in clinical infertility in men and women (Naz 1988, 24; Naz and Menge 1990, 513). This seemed to enhance the possibility that an anti-sperm vaccine for both women and men could be realized:

Nature has provided a human model to illustrate how an immunological contraceptive would work through the occurrence of infertility
in some men and women with anti-sperm antibodies (Menge 1980, quoted in Naz and Menge 1990, 515).

For an anti-sperm vaccine to be effective, it is not sufficient that antibodies against a sperm antigen circulate in the bloodstream: anti-sperm antibodies should be present in the male or female reproductive tract to encounter sperm:

Ideally, antibodies against the antigen should be present throughout the reproductive tract at concentrations sufficient to result in a complete inhibition of fertilization. As yet, little is known regarding the male tract and the induction of local antibodies that would effectively bind to and inhibit sperm function without also possibly causing immune orchitis. Good experimental animal models duplicating the condition in man have still to be found. In the female, however, there is a rather extensive literature concerning (...) the various sections of the genital tract (Naz and Menge 1990, 515).

Naz and his colleagues chose the female rabbit as a model to study the effects of immunization with FA-1 on fertility (Naz 1988, 24). Although the sperm antigen FA-1 had been an ‘androgy nous’ antigen, the structuring of the research practice was not gender-neutral. The idea of developing immunological contraception for either males or females was actively considered by the researchers involved. However, this representation of future users could not be objectified in the technical choices of the researchers. Instead, a user with a definite sex was inscribed in the developing technology. The development of modern molecular biological techniques in the mid-1980s changed the availability of potential target substances (Naz 1990, 748). In contrast to hCG, the availability of sperm antigens was largely independent of the existing gynecological infrastructure as a result of advances in molecular biology. But now the availability of suitable male animal models became an obstacle in developing an anti-fertility vaccine for male users. The sex of future users of an FA-1-based vaccine became relevant to researchers in the light of the unequal level of knowledge from animal models of the male and female reproductive tracts. Thus the appearance of embodied laboratory animals in the developmental trajectory of the FA-1 vaccine did help to determine whether this method would be developed for men or women. This was not because of essential differences between male and female bodies, nor did I find any indication of these researchers explicitly preferring to develop a method for one or the other category of users. On the contrary, the idea of a vaccine to be used by either males or females had been amply lauded. But the development of this vaccine was embedded in an already existing and
historically specific infrastructure of contraceptive development, characterized by the underdevelopment of knowledge about male reproductive functioning.

Another research team working on an ‘androgy nous’ sperm antigen was the NIH-supported group at the University of Connecticut, led by the husband-and-wife team of Paul Primakoff and Diana Myles. These researchers also tested their preparations in both male and female test animals. The sperm protein PH-20 was reported to be an effective contraceptive in both male and female guinea pigs. In 1988, they published in the journal Nature a letter headed:

Fully effective contraception in male and female guinea pigs immunized with the sperm protein PH-20 (Primakoff et al. 1988, 543).

This finding greatly encouraged the anti-sperm vaccine researchers (Aldous 1994). Unfortunately, PH-20 also caused autoimmune testicular inflammation. As one of the researchers involved, Gary Hunnicutt, commented:

Unless some new technology was going to come about where one could block testicular inflammation from happening, it just didn’t look as though the anti-PH-20 vaccine for men was going to be feasible (interview with Hunnicutt 1;15).

But the possibility of developing such a new technology was not further explored, and research into an anti-PH-20 vaccine for men was abandoned, although the relevance of the testicular inflammation found in the guinea pigs for assessing the possibility of developing an anti-PH-20 vaccine for men remained contested. At a conference on the immunological control of fertility in 1994 in Australia, the findings of the PH-20 experiments were discussed once more. One reproductive scientist observed that guinea-pigs are very sensitive to such conditions compared with other animals: the observation had only been reported in the guinea-pig (Dunbar 1994, 359). Another researcher, who had collaborated in the project, observed that the experiments had been done with PH-20 antigen purified from guinea-pig testes and not recombinant PH-20. Such native PH-20 might be expected to be more biologically active, and could therefore perhaps account for the side-effect, he said (Tung 1994, 359). Nevertheless, research into this vaccine has been followed up for females only.

But the findings of Primakoff and Myles and their colleagues on contraceptive effectiveness in male and female laboratory animals had a distinct effect on the further course of anti-fertility vaccine research. While more closely observing the processes in the male genital tract, researchers noticed that PH-20 on the sperm surface undergoes a molecular transformation after the sperm leave the testes but before they are ejaculated (interview with Hunnicutt 1;19). Immunological inhibition of these changes in the
sperm at the time of passage through the epididymis would affect their ability to function in fertilization. Primakoff and Myles identified a second sperm antigen, Fertilin, that was involved in these changes. Post-testicular interception of sperm in men would remove the danger of autoimmune testicular damage (see Aldhous 1994, McClure 1994). Thus, the work on the 'androgynous' antigen PH-20 helped to focus attention on the male reproductive tract for investigation. Remarkably, in the research on Fertilin, one of the most advanced studies on sperm antigens for men, female test animals were used:

Another approach being taken is to develop strategies for immun contraception in males. These strategies involve immunization with fragments of Fertilin (PH-30) with the aim of achieving contraceptive efficacy while eliminating orchitis and other inflammatory responses. In particular, female monkeys and mice immunized with protein domains containing the active site of Fertilin β are being tested for contraceptive efficacy (McClure 1994, 4).

Here we see another example of reproductive scientists rendering irrelevant the sex of the bodies they work with. Even in the human stage of experimentation, sex is not necessarily bracketed out. In order to perform at short notice a small clinical trial in Sweden with the WHO’s anti-hCG vaccine, it was proposed that the involved researchers - both men and women - would themselves be the participants (interview with Griffin 1:55). As the aim was to evaluate the safety of the vaccine and not its efficacy in preventing pregnancy, researchers found no reason to exclude male bodies. However, both of the 'androgynous' sperm antigens FA-1 and PH-20 ended up being developed for female users only. To overcome the established practice was not easy. Seemingly, given the availability of research materials, animal models, and knowledge and experience of reproductive functions, it was more self-evident to go on developing methods for women. There was, however, one other 'androgynous' antigen which has led to the furthest progress in developing an anti-fertility vaccine aimed at use in the male body. This is the Luteinising Hormone Releasing Hormone (LHRH), also called Gonadotrophin Releasing Hormone (GnRH). This research and development was done at the Population Council. What permitted he Population Council to act as "genderbender" (Oudshoorn 1996) and develop a method for men? What was necessary to include males in reproductive science?
4. The reappearance of men

Confronted with the lack of possibilities for funding and the lack of interest on the part of their collaborating centres in an anti-hCG vaccine, the Population Council reconsidered its research leads in the early 1990s. In 1992, the NIH invited the Population Council to apply for a grant. The Population Council submitted their project to develop a pre-fertilization vaccine against LHRH for male users. The choice of LHRH as a target substance in males was shaped by a number of historically specific political, economic, material, and social factors.

Immunization against LHRH in women would disrupt ovulation and the menstrual cycle. In men it suppresses not only spermatogenesis but also the production of testosterone and therefore libido. To compensate for the suppression of sex steroid hormones both in men and women, a replacement had to be administered concomitantly. According to the Population Council, an LHRH vaccine for women would therefore have no advantage over other (hormonal) contraceptives. The then Director of the Contraceptive Development Program of the Population Council, Rosemarie Thau, commented:

In females, immunization against LHRH appears less promising, since the processes which are interrupted are more complex and steroid replacement would be more difficult. Moreover, in women several more desirable approaches for contraceptive vaccines are available (Thau 1992, 128).

In 1992, the Population Council determined to develop this method for men. This decision was not predetermined by male and female reproductive biology. The team at the National Institute of Immunology in New Delhi, by contrast, made a different trade-off. These researchers argued that an anti-LHRH vaccine could be used by women whose menstrual cycles are usually disrupted temporarily anyway due to the suppression of LHRH: breastfeeding women (Talwar et al. 1992a, 948). But this line of research was short-lived. The clinical trial that this team carried out in 1992 with an LHRH vaccine to postpone the return of fertility and menstruation in women who had just given birth raised concerns of other scientists in the field and of international women’s health advocates, who considered this research unethical (Minutes SC 1991, 31; Talwar et al. 1992b, 7; Richter 1996, 96-97).

A number of additional factors were involved in the Population Council’s decision to focus on an anti-LHRH vaccine to be used by men. Since an anti-LHRH vaccine would suppress the production of testosterone, it could also play a part in the treatment of patients with testosterone-dependent cancer of the prostate. This relation between the contraceptive and cancer
treatment had various advantages. First, on the basis of this relation, the anti-LHRH vaccine could be portrayed as not just another contraceptive but as promoting reproductive health. According to the Director of Reproductive Physiology, James Catterall:

We are reproductive health oriented. So conditions that come to mind that fit in that broader context are prostate hypertrophy, prostate cancer, breast and cervical cancer, and menopause (...). And these are all things that our contraceptive products may help to alleviate, if given in a slightly different dosage regime. So rather than be blind to those other potential uses, we try to broaden our scope a little bit and not just focus on contraception (inter-view with Catterall 1;2).

According to the scientists involved, the anti-LHRH vaccine fitted well into this new profile. Second, patients with cancer of the prostate were an opportune and accessible test population. The United States Food and Drug Administration guided the Population Council scientists to initiate a clinical trial in this population, since men with prostate cancer stood to benefit most from reducing circulating testosterone (Catterall, personal communication 8 July 1997). This opportunity was most welcome. Men are not habitual visitors to family planning clinics, and are therefore relatively more difficult to recruit for enrollment in a contraceptive trial. Talwar and his team had already conducted clinical trials in patients with prostate cancer in two centers in India and in one other center in Austria (Talwar 1992, 3). The Population Council’s first clinical trial to test the safety and performance of their anti-LHRH vaccine was carried out in twelve patients with prostate cancer (Thau 1992, 128). And third, the reorientation of the Population Council’s focus also entailed an attempt to get industry involved in an early stage of the research process. One contributing factor to the low incentive for industry to work in the field of contraceptive research and development was that the major expanding market was in developing countries, where pharmaceutical sales were generally less profitable (Fathalla, Diczfalusy and Spieler 1995, 2). But as cancer of the prostate is the second most frequent form of cancer in men, there were prospects that the anti-LHRH vaccine might attract research funding from the pharmaceutical industry. As Catterall said:

I think that broadening our focus was an interactive event that had to do with our examination of our mission and the Cairo Conference. And the vision of people in this field of how needs of population research were changing. And also the Foundations and other people that fund us let us know that they were interested in these other issues as well (interview with Catterall 1;4-5).
Reflections about the sociocultural feasibility of male contraceptives were invoked as well. As one of the researchers involved, Anna Ladd, observed in a review article:

In the past 20 years, there has been a definite social trend towards shared responsibility for family planning, and many men desire to exercise control over their own fertility. This has led to an increased interest in the development of new means for regulating male fertility (Ladd 1993, 189).

To be sure, according to the scientists involved, this newly embraced male desire to control their fertility did not in the least contradict the Population Council's primary mission to encourage the control of population growth. The senior staff scientist in charge of conducting clinical trials with the anti-LHRH vaccines, Claude Aguillaume, asserted:

(...) emphasizing male contraceptive responsibility is a key to getting men both to fulfill their broader obligations and to contribute to population stabilization (Aguillaume 1994, 2).

In sum, an anti-LHRH vaccine for men permitted the Population Council to develop a non-abortion-related vaccine of potential interest to industry. This antigen was simple to make and some knowledge of its performance was available from the Indian research. Whether or not a vaccine for either men or women could be made on the basis of this antigen was not a consideration in selecting this target substance. But in the context of the above-mentioned historically specific factors, the Population Council made an explicit choice in favor of male users.

5. Conclusions

In this chapter I have explored the reasons why most immunological contraceptives are being developed for female users, in spite of the researchers' claims that the method could be developed "for either men or women". One explanation could have been that scientists stressed the 'androgy nous' possibility just to highlight the scientific novelty of the method, or to please the policy-makers at WHO who hoped to support the development of a method that would be appealing to a broad array of member states. However, I found that the absence of a distinction between the development of a method for male or for female users was deeply rooted in the research practices of the reproductive scientists. The question of whether the method would be for male or female users was in fact not a relevant consideration for the biomedical scientists. Yet, the choice of molecules of the zona pellucida,
sperm antigens involved in fertilization process, or hCG as the antigen against which a vaccine would be developed had implications for the sex of the future users of the method. Another obvious explication for the scanty research into male immunological methods could have been that the male body simply provides relatively little opportunity for contraceptive intervention. Immunological contraceptives were an excellent occasion to explore the tenability of this argument. While a number of possible target substances were present in only the male or the female body, a few of these substances were present in both, such as surface molecules of the sperm and LHRH. I have examined the course of the research on these ‘androgynous’ antigens, and I have argued that the lack of research into male immunological methods does not follow automatically from male physiology. Yet, the distribution of opportunities for developing anti-fertility vaccines for male or female users was not merely contingent, but embedded in a certain context that evolved over years of doing reproductive research.

I have approached the question about the asymmetric situation in anti-fertility vaccine development by analyzing the ways in which the bodies of future users were implicated in the early developmental work of the biomedical scientists. Representations of users’ bodies played an important role in making anti-fertility vaccines feasible. Clinicians, immunologists, and reproductive biologists constructed a representation of users’ bodies on the basis of the material and cognitive resources of their various scientific disciplines. In the newly constituted area of reproductive immunological research, users’ bodies were represented as a cascade of target substances. In this representation, the sex of future users was disregarded by the researchers. The disappearance of the notion of two stable and opposite categories might have facilitated the prospect of exciting new ways to develop reproductive technologies. But the sexless representation of users’ bodies could not be integrated into the technological design. The sex of future users was an important characteristic of the evolving technology, and predominantly female users would be supplied whereas male users tended to be ignored.

Anti-fertility vaccines with a clear gender script evolved, and from a perspective on change it was important to understand why. How could it be that the sexless representation of the users’ bodies was so prominent in the accomplishments of the researchers, and yet was not inscribed in the developing technology? This finding seems to diverge from Akrich’s work (1992, 1995), in which the users’ representations of innovators play a key role in the way a script evolves. Here we see that the emergence of a joint representation of users’ body was of central importance in envisioning the possibility of immunological approaches to contraception. But the work of reaching agreement about the sites where immunocontraceptive intervention could take place was more important than the content of the picture. This is in line with
my finding in the first chapter: that representations of users fulfill more functions than simply that of directing the work of innovators. The main function of the cascade of target substances was that it permitted the fusion of different disciplinary approaches, and not that it led researchers towards developing one vaccine or another.

How, then, can we understand that anti-fertility vaccines were developed against some antigens and not against others? The study of researchers’ work, with a focus on the gendered bodies of future users, yielded insight into the fact that most anti-fertility vaccines are developed for female users. Material and institutional factors have played an important role in facilitating the development of certain types of anti-fertility vaccines and not of others. The impact of materiality was clearly illustrated by the availability of the hormone hCG in the 1970s, which allowed this research lead to become the most advanced one. The availability of animal models and the access to male or female patients also affected the continuation or discontinuation of research into methods for men or women. But even so, researchers were able to bracket out sex, as was illustrated by the use of female test animals in the development of an immunological contraceptive to be used by men. Researchers decisively influenced the course of their research when they decided to discontinue it once they had detected side-effects from immunizing with PH-20 in male guinea-pigs, or when they considered their knowledge of the male reproductive tract to be insufficient. In addition, funding policies and political discussions have played an important role. The far-reaching consequences of national and institutional funding policies were exemplified by the effects of the ban on abortion-related research in the U.S. Without this ban, research on anti-hCG vaccine might have proceeded faster, and research on pre-fertilization antigens might have received considerably less attention. Ironically, fewer NIH-supported opportunities to explore ‘androgynous’ or male antigens might have emerged. Another example of the influence of funding policies is when the Population Council sought a rapprochement with the pharmaceutical industry, which in turn favored a particular approach to the development of the new product. Importantly, political discussions pursued at international conferences have resounded in contraceptive development. Funding opportunities have been closely linked to political and cultural notions such as the political viability of the moment of interrupting fertilization, the desirability of male responsibility in contraception, or the urgency of population control.

The unequal distribution of sex in reproductive matters has been remarkably persistent over time and in different contexts. But these recurrent patterns do not simply unfold along a historical trajectory under their own momentum. Rather they are reproduced and remade in situations which could have been otherwise. I have shown how researchers have defined, redefined, or ignored male and female bodies, yet the female body nevertheless became
the reproductive body. The considerable room for manoeuvre that researchers encountered in their endeavours to develop new contraceptive methods suggests that a medical technology does not necessarily have to develop as it actually does.
Notes by chapter 2

1. The concept of implicated actors was introduced by Clarke and Montini (1993). See also the Introduction to this thesis.

2. Following the reports of antibodies against reproductive tract antigens in infertile patients, the WHO’s Task Force for Immunological Methods for Fertility Regulation set up a Reference Bank for Reproductive Immunology in 1974 (Hjort and Griffin 1985). Sera of infertile persons were collected, examined and compared with those of fertile controls. Major problems soon arose, particularly in trying to standardize the assignment of sera to one of the 16 clinical categories of donors. The project generated all kinds of variations between the results of participating laboratories, between different types of tests and between samples of sera. This approach was postponed in 1977 (Griffin 1991, 167; Jones 1994, 112).


4. There is a striking similarity with the early history of the development of the Pill: the contraceptive potential of oral progestines was first tested in those who visit gynecologists: women with infertility (Oudshoorn 1994, 119).

5. Contemporary practitioners in the field of reproductive immunology tend to date the history of their field from 1899, when E.Metchnikoff at the Pasteur Institute in Paris and M.Landsteiner in Vienna injected (human and guinea pig) sperm into the peritoneal cavity of guinea pigs and described the formation of antibodies (Metchnikoff 1899, Landsteiner 1899). Although Metchnikoff mentioned the possibility of other applications of these sera, apparently his primary interest was to use them as a medium for his physiological studies. However, the question was raised of what effects, if any, were produced by spermatozoa invading the female tissues, and these and slightly different experiments were repeated over and again. The authoritative Journal of the American Medical Association devoted an Editorial to the subject in 1921 (Editorial, 1921). In 1926, S.Rosenfeld injected three women with semen, following vague reports of birth-control clinics which seemed to show that this could avert pregnancy for about twenty months (Katsch 1959, 950; Jones 1974, 377). In 1937, U.S. Patent number 2,103,204 was awarded to M.J.Baskin from the Department of Gynecology, University of Colorado (Denver), for a nonspecific spermatoxic vaccine and for the process involved in producing the vaccine. Baskin had studied the practical applications for preventing pregnancy by injecting twenty women with fresh human sperm
(Baskin 1932). The patent claimed the invention of "a determinant (...) usable as a vaccine or antigen in vaccination of human female to produce spermatoxic condition in her blood and secretions", but was never put into use (cited in Katsch 1959, 950). The history of the study of placental antibodies is presented as a different research line than the work on sperm. This lead originated in 1903, when M.S.Dobrowolski described the production of sera against an extract of the placenta of guinea pigs and rabbits and demonstrated their capacity to interrupt pregnancy. He then explicitly speculated about human application of his finding (Dobrowolski 1903). As with the anti-sperm antibodies, similar reports continued to appear occasionally.

6. One exception has been described by Catherine Waldby (1995). She has analyzed the discursive construction of permeable male immunological body boundaries, in particular of the receptive partner in anal sex, in relation to the emergence of the AIDS epidemic in the 1980s.

7. See for similar reasoning Talwar, Naz and Das (1979, 5882) and Anderson and Alexander (1983, 564).

8. The quote continues: "The female is biologically tuned to limited reproduction. She ovulates only once a month and rarely is more than one egg shed. The fertile life of the egg is fairly limited. After shedding, the ovum has to be taken up by a functional fallopian tube and retained for a defined period to permit the uterus to gain receptivity for implantation. (...) It is tempting for the biologist to formulate strategies for intervention at any of these numerous points in order to achieve control of fertility. Besides biological considerations, the female is also more highly motivated to practice family planning methods, for she bears the brunt of maternity" (Talwar 1979, 67). This gender-stereotypical metaphor in reproductive science has been comprehensively analyzed by, among others, Emily Martin (1991). See also Irma van der Ploeg (1995) for an analysis of the unequal distribution over male and female bodies of abilities for In Vitro Fertilization for the treatment of male infertility.


10. In the period from 1974 to 1979 the Task Force on Immunological Methods for Fertility Regulation of the WHO/HRP worked on vaccines against a range of antigens: the C-terminal peptide of the β-subunit of human Chorionic Gonadotropin (CTP-BhCG), human Placental Lactogen (HPL), non-hormonal trophoblastic antigens (SP1 and PP5), antigens of sperm (acrosin,
hyaluronidase and LDH-X), and antigens of the zona pellucida (WHO/HRP 1973, 13; Diczfalusy 1975, 448-451; Griffin 1991, 167-169). As had been foreseen in the research program of the Task Force, a progressive reduction was made in the number of leads supported. From the early 1980s on, by far the greatest amount of work carried out by the Task Force has been concerned with the development of a vaccine against the placental antigen hCG, to be used by women. The research team at the National Immunological Institute in New Delhi worked on a great many different vaccines both for male and female users, but concentrated on a preparation directed against hCG. University-based research groups in the United States worked on the development of immunological contraceptives against a range of sperm antigens, mostly to be used by women, and against antigens of the outer layer of the ovum, the zona pellucida. The Population Council developed a prototype vaccine against hCG but, abandoned this lead in the early 1990s to concentrate research efforts on the development of an anti-LHRH vaccine.


12. The Clinton Administration restored these programs in 1993 (Roush 1994, 1165).

13. A similar reaction by the pharmaceutical industry happened in the United States concerning the emergency contraceptive pill RU 486R. The then director of the Center for Biomedical Research of the Population Council, Wayne Bardin, said "every pharmaceutical industry in the country turned it down" when it came to testing and marketing the drug, for fear of being targeted by a political backlash. (quoted in Service 1994, 1485). Anti-abortionists in the U.S. threatened boycotts and other actions and received front-page treatment in the New York Times. The Reagan Administration supported these protesters (Djerassi 1989, 359). See Clarke and Montini (1993) for a comprehensive account of the reception of RU 486R in the U.S.

14. Note for example, the remarkable parallel with the establishment of the regimen of medication in the development of the contraceptive Pill, which was also guided by an attempt to mimic normal menstrual periods (Oudshoorn 1994, 112-135). In the 1970s and 1980s, cultural anthropologists extensively documented the social, cultural, and religious importance of menstruation. After the introduction of two other long acting contraceptives, the hormonal injectable Depo ProveraR and the hormonal implant NorplantR, acceptability studies in the 1980s indicated that disturbances of the menstrual cycle were the main reason for women to discontinue their use. Also women's health advocates stressed the effects of menstrual disturbances on women's daily well-being and their ability to monitor their reproductive
health. Physicians considered that heavy bleeding and more or longer periods could lead to anaemia and that other disturbances could disguise a number of adverse health conditions (Hardon 1992, Wolffers, Hardon and Jansen 1989).

15. Thanks to Anita Hardon, who suggested this term.

16. See also Jones (1994, 323), and Jones (1996, 73).

17. The sperm antigens found with monoclonal antibodies were identified and characterized to see if they were specific for sperm and had a function in fertilization. Then they were tested in laboratory animals such as mice, rabbits, and guinea pigs. If the antigen elicited a sufficiently strong immune response in these animals, the next step was to obtain a large quantity of the antigen. Subsequently, the immunogenecity and anti-fertility effects of the antigen in primates could be evaluated. Substances that were regarded as safe and effective in primates would then eventually proceed to clinical trials (Primakoff 1994, Naz and Menge 1990, Naz 1988, Naz 1990).

18. The principal investigator of this clinical trial, Marc Bygdeman, described this plan in a letter to the German women’s health advocate Judith Richter (quoted in Richter 1996).

19. The international ethical guidelines for biomedical research involving human subjects of the Council for International Organizations of Medical Sciences states: "As a general rule, pregnant or nursing women should not be subjects of any clinical trials except such trials as are designed to protect or advance the health of pregnant or nursing women or fetuses or nursing infants, and for which women who are not pregnant or nursing would not be suitable subjects" (CIOMS 1993). When Talwar presented the clinical work in breast-feeding women at the 1991 meeting of the Steering Committee of the Task Force for Immunological Methods for Fertility Control, concern was expressed about the possible transfer of anti-LHRH antibodies to suckling infants and the adverse effects that this might have (Minutes SC 1991, 31).

20. Note that in this interview Catterall gave a very specific interpretation to the term "reproductive health" by understanding it as the extension of the use of contraceptive products to other conditions. Another interpretation is, for example, phrased in the document signed at the United Nations Conference in Cairo: "Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of infirmity, in all matters relating to the reproductive system and to its functions and processes (...)" (United Nations 1994).