

Contraceptive vaccines for men

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Contraceptive options for men are few; condoms, vasectomy and withdrawal method. Research on male contraceptives has been going on for quite some time. The job of 'the pill' in women is easy, as it has to block only a single egg, while a male contraceptive has to take care of millions of sperms. Several birth-control development programmes for men are being taken up by researchers, who have used specific combinations of testosterone and progestin to reversibly suppress sperm production in men. The problem faced here is the short life of testosterone, which gets broken down quickly in the liver. Varied drug-delivery systems have been tried, for instance, creams, monthly injections, implants in the arm and so on.

In an effort to develop a safe, effective and reversible contraceptive method for men, researchers are now considering vaccine as an alternative approach for fertility control. The possibility of using sperm antigens for making a vaccine arose when anti-sperm antibodies were known to be associated with infertility^{1,2}. The sperm antigen used for making the vaccine should ideally be sperm-specific, immunogenic and should cause infertility on active or passive immunization. For this purpose scientists have identified varied sperm antigens to be used for the development of a contraceptive vaccine for men^{3,4}.

The human sperm antigen, 80 kDa HSA was identified from human sperm extract⁵ and was found to be highly immunogenic. Because of its localization on the sperm surface and its presence only in the testes and epididymis, was considered safe for development of a contraceptive vaccine. Pure 80 kDa HSA was found to impair fertility in male and

female rats following active immunization^{5,6}. Its synthetic peptides NT, 1, 2 and 4 were found to be immunogenic and they mimicked the native protein.⁷ This is what led to the use of these synthetic peptides as safe and convenient immunogens. These are better than the recombinant antigens as they can be synthesized and purified in large quantities at a lower cost.

Following studies on rats, research was conducted on rabbits and marmosets by Bandivdekar and his team at the National Institute for Research in Reproductive Health (NIRRH), Mumbai. Their paper⁸ reports the evaluation and suitability of NT, and 1, both synthetic peptides for development of contraceptive vaccine.

Partial N-terminal amino acid sequence of 80 kDa HSA (peptide NT) and that of peptide-1 were determined at the Protein/DNA Technology Center, Rockefeller University, New York. These peptides were synthesized by F-moc solid phase peptide synthesis method using a peptide synthesizer. These were then purified by HPLC and the purity was checked by mass spectrometry. The peptides were conjugated to keyhole limpet haemocyanin and then used for active immunization of male fertile rabbits. Peptide-1 induced infertility in all the six rabbits (100%) from the treated group, while peptide-NT induced infertility in three out of five rabbits (60%). Low fertility was noted in the other two animals.

The contraceptive effect was further investigated in marmoset, a non-human primate model. Active immunization with peptide-1 induced reversible infertility in six out of seven animals. All animals were found to be healthy with normal

morphology and histology of tissues of testes, epididymis and seminal vesicles.

Synthetic peptide-1 of 80 kDa HSA particularly looks to be a promising candidate for development of a contraceptive vaccine. The peptide molecule, especially peptide-1 identified by the NIRRH team is 'sperm-specific', which results in temporary infertility without interfering with other body proteins. Further toxicological studies are being conducted using bonnet monkeys and these will be then followed by stringent human trials. Research in this field has also been carried out by Anil Suri, at the National Institute of Immunology, New Delhi and a research team led by P. Primakoff, Department of Physiology, University of Connecticut Health Centre, USA.

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