BIOMATERIAL SCAFFOLD IMMUNOCONTRACEPTIVE VACCINATION AGAINST GONADOTROPIN-RELEASING HORMONE

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A single shot and permanent contraceptive vaccine that can be delivered with minimal expense and animal handling could help control feral populations and end the euthanasia of healthy animals in shelters. A promising target for a contraceptive vaccine is the small Gonadotropin-releasing Hormone (GnRH) peptide, a master regulator of mammalian reproduction in both male and female individuals. However, it has been challenging to elicit potent and long-lasting humoral responses against short peptides due to their lack of immunogenicity and short half-lives *in vivo*. Here, we used an injectable Mesoporous Silica Rods (MSRs) biomaterial platform to elicit anti-GnRH antibodies. High aspect ratio MSRs loaded with bioactive agents can be injected in the subcutaneous space where they spontaneously form macroporous scaffolds that promote immune cell infiltration. The controlled release of Granulocyte-Macrophage-Colony Stimulating Factor (GM-CSF) and CpG ODN adjuvant from the scaffolds locally recruits and activates a large number of antigen-presenting dendritic cells (DCs) and stimulate adaptive immunity. The MSR platform delivering GnRH-carrier protein conjugates as an antigen source significantly enhanced serum anti-GnRH antibody production as compared to the current state of the art bolus vaccine formulation. Anti-GnRH responses generated with this platform remained elevated for over a year. Mice vaccinated with the MSR had more active draining lymph nodes and developed highly persistent germinal centers (GCs) that were still present more than 3 weeks after antigen encounter. In addition, a short linear GnRH-T-helper fusion peptide elicited higher antibody titer than subcutaneous Alum depot and could disrupt estrous cycle and impact reproductive success of female mice. Overall, the MSR technology is a promising platform for the development of a minimally invasive reproductive vaccine.