



## **Porcine Zona Pellucida Vaccine to Control Ovulation in Hens**

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Ovulation-associated diseases are common in companion birds. Surgical removal of the oviduct or hormonal therapies have been the only methods available to attempt control of these problems. A vaccine derived from the porcine zona pellucida (pZP) has been used as an effective and safe immunocontraceptive in multiple mammals including horses and elephants.<sup>1</sup> Experimental data suggests that the pZP vaccine may be helpful in preventing ovulation in hens.

The beginning unit of female reproduction is the primordial follicle, which can be defined as a large central cell, the ovum, surrounded by a layer of squamous follicular cells. As the ovum develops, a homogenous glycoprotein layer accumulates between the oocyte and the surrounding follicular cells. This acellular protein coat surrounding the ovum is called the zona pellucida. In mammals, the zona pellucida is comprised of 3 glycoproteins.

During the period that the oocyte is contained within a follicle, processes from the cumulus cells penetrate the zona pellucida and connect to microvilli from the oocyte forming gap junctions. These gap junctions create a channel for biochemical communication and metabolite transfer between the oocyte and follicular cells. With oocyte maturation, these cellular associations are lost.<sup>2,3</sup>

In the ovulated oocyte, the zona pellucida's composition and structural integrity provide a protective barrier for the oocyte as well as a biologic capsule to help maintain the proper chemical environment for the oocyte.<sup>3-5</sup>

The zona pellucida glycoproteins are the receptor molecules that are necessary for efficient binding of spermatozoa. Zona pellucida vaccines have been shown to function as an immunocontraceptive by



stimulating antibodies that interfere with the binding of sperm to the egg.<sup>1</sup> In some species, zona pellucida vaccines function as immunosterilents by interfering with follicular development and differentiation.<sup>6</sup> In baboons, vaccination was shown to reduce the number of antral follicles in the ovary.<sup>7</sup>

The degree of ovarian changes following zona pellucida vaccination has been shown to vary with the purity of the antigen, susceptibility of the individual animal and the presence or absence of T- and B-cell epitopes on the immunogen.<sup>8</sup> Reduction of the T-cell epitopes on specific zona pellucida glycoproteins has been used to reduce ovarian pathology and maintain antibody-associated interference with fertilization of the ovum.<sup>9</sup> In several species, repeated vaccination has been shown to erode the follicle pool, increasing the likelihood of vaccine-associated sterilization rather than immunocontraception.<sup>10-12</sup>

Hens vaccinated with purified porcine zona pellucida proteins developed antibodies to the immunogen and ceased egg production. This finding suggests that a zona pellucida vaccine may prove helpful in preventing egg-related problems in birds.

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