



OncoVet™ Veterinary Electroporation System

For Antibody Production and Tumor Treatment in Animals

Cyto Pulse™ Electroporation and Electrofusion Systems for:
In vivo therapeutic delivery
Gene therapy
Immunotherapy
Hybridoma production
Vaccine delivery
Nuclear transfer

mRNA delivery
siRNA delivery
plasmid delivery

The OncoVet system delivers material *in vivo* into animal cells by electroporation. Typically the material (e.g. therapeutic or polynucleotide) is first injected into animal skin or tumor site by hypodermic needle, followed by electrode insertion and application of an electric from the waveform generator. The applied electric field forms small pores in the animal's cells and drives the material in before re-sealing. OncoVet is the Veterinary version of the Cyto Pulse Derma Vax™ clinical DNA vaccine delivery system.



The system consists of a voltage waveform generator and parallel row needle electrodes. An internal computer running Windows® Mobile 6.0 allows operation via a touch screen on the front panel and logs all of the resulting data including digitized pulse voltage and current waveforms. All data is stored in local non-volatile memory and can be retrieved onto a USB key for detailed analysis.



Antibody Production

This OncoVet™ Veterinary Electroporation System is very efficient in delivering polynucleotides for producing antibodies in animals. Polynucleotide vaccines have improved dramatically since the first naked DNA vaccines were delivered intramuscularly. This is principally due to improved *in vivo* delivery using electroporation. A preferred site for vaccine delivery is skin for several reasons. The skin is an immunologically active site and it is easily accessible. In addition, gene expression in skin persists long enough for the immune system to respond to the secreted antigen. Gene expression in skin is 2 logs higher when delivery is enhanced by electroporation compared to simply injecting plasmid DNA.

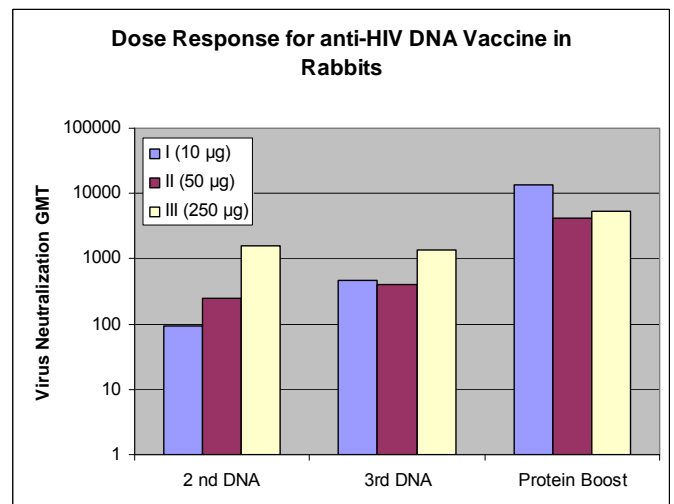


There are two methods for producing antibody using gene based vaccines. One is to simply vaccinate animals and harvest polyclonal antibody. Another is to vaccinate animals for the purpose of harvesting B cells that can be used to produce monoclonal antibodies using electrofusion.

Polyclonal Antibody Production Example Courtesy of MaxyGen (Dr. Robert Whalen)

Vaccine specific antibodies have been successfully induced by Derma Vax (the human clinical version of OncoVet) which has delivered DNA vaccines in several species (mice, rabbits and non-human primates). The following is one example of its use with rabbits. Rabbits were vaccinated at days 0, 28 and 56 using varying doses of vaccine plasmid expressing HIV GPI20 administered in divided doses (two 40µl injections for the 10 and 20 µg dose and four 40µl injections for the 250 µg dose). Plasmid concentrations were adjusted to allow administration of intended dose. The vaccination procedure consisted of intradermal inoculation of the vaccine plasmid in PBS followed by electroporation of the site using the Derma Vax system. In addition, prime boost vaccination was evaluated by administering a protein boost after the last electroporation enhanced dose. Neutralizing antibody titers were assayed using an assay sensitive HIV virus SFI62.

Good antibody titers were induced by all three doses of vaccine with the highest titer in rabbits given the highest dose. The difference among doses was less distinct after the third dose. Interestingly, the lowest plasmid dose primed rabbits for the highest response after boosting with a protein vaccine. This data shows that good antibody titers can be elicited using either electroporation enhanced plasmid vaccines or the same vaccines followed by a protein boost.



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UL 60601-1
 E1282007
 CAN/CSA C22.2 601.1

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Nov 2008
 Printed in USA

Part No. 015-101016

Tumor Treatment – Electrochemotherapy (ECT)

ECT Parallel row needle electrode arrays are 10 mm to 25 mm long. A therapeutic is injected intravenously or directly into the tumor with a hypodermic needle. The electrode is then inserted and the electric field is applied delivering the drug into the cancer cells. This is a local treatment.



The two chemotherapeutic agents usually used in Veterinary Medicine with ECT are Bleomycin and Cisplatin. The agents can either be given intravenously or infused into the tumor. A typical treatment follows (courtesy of Ron Lowe, DVM):

“Bleomycin is injected intravenously at a dose calculated using body surface area. After a delay of 8 minutes to allow tissue levels to maximize, electroporation is applied to the tumour, starting with the margins, generally at least 1 cm of apparently normal tissue, and working in concentric circles into the body of the tumour. The deep margins are assessed by radiography or palpation. Treatment of a 1 cm deep margin is attempted in all cases. Where bone was encountered within the extent of the tumour, attempts are made to treat it by bridging across it with the electrode needles”. This therapy is an alternative to standard therapy such as surgery or radiotherapy. ECT can be carried out intraoperatively or post-operatively

The sequence of photos on the right shows Squamous Cell Carcinoma on a Mastiff's carpus before, during and after treatment. The ECT dissolved the tumor and there was no reoccurrence. The images are courtesy of Ron Lowe, DVM. Additional treatment results maybe found at:

<http://www.petcancervet.co.uk/ect.htm>

The OncoVet™ Electroporation System Includes

- CCEP-10 Voltage Waveform Generator
- Parallel row electrode array (specify type, see electrode data sheet)
- Handle with Connector Cable
- Footswitch for hands-free operation (optional)
- User Manual

Specifications

User Interface	Resistive Touch Screen Display Footswitch (optional)
Pulse Amplitude	50 to 1000 volts
Pulse Width	0.050 to 10 ms
Pulse Interval	0.200 to 1000 ms (5 kHz to 1 Hz)
Data Access	USB Flash Key

Electrodes Available for Veterinary Applications

(see electrode data sheet for details)

IDA-4-4-2	Dermal delivery for antibody production	Fine Point
IDA-4-6-2	Dermal delivery for antibody production	Fine Point
ITA-6-6-10	Intra-tumor delivery	Fine Point
ITA-6-6-25	Intra-tumor delivery	Trocar Point

Cyto Pulse License Required

Cyto Pulse has patents, patents pending, and other intellectual property on the OncoVet™ system and it is only supplied directly by Cyto Pulse under license agreement for veterinary applications.

Specifications may change without notice

