

Generation of monocytes-derived dendritic cells from chicken blood for in vitro studies

Commonly used acronym: DENDRICHICK

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Organisation

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SCOPE OF THE METHOD

The Method relates to	Animal health
The Method is situated in	Regulatory use - Routine production, Translational - Applied Research
Type of method	In vitro - Ex vivo
Species from which cells/tissues/organs are derived	Gallus gallus domesticus
Type of cells/tissues/organs	Blood

DESCRIPTION

Method keywords

Monocytes

dendritic cells

chicken

PBMC

Scientific area keywords

Dendritic cells isolation

Immunology

vaccination

immunogenicity

Method description

The purpose of the present development is to use avian MoDCs to implement a cellular platform to increase understanding of the immune responses induced by various antigens of interest (e.g. vaccine candidates) and evaluate their immunogenic potential. Considering the difficulty to work on dendritic cells (DCs) isolated *ex vivo*, we developed a protocol for using *in vitro*-generated chicken monocyte-derived dendritic cells (MoDCs). Plastic-adherent peripheral blood mononuclear cells (PBMCs) isolated from specific-pathogen free (SPF) chickens are cultured with GM-CSF and IL-4 for 5 days at 41°C in 5% CO₂ atmosphere. Following antigen-induced maturation (e.g. LPS, polyinosinic-polycytidylic acid, viral antigens, etc.), typical DC morphology is confirmed by microscope. The endocytic capacity and the expression of surface expression of mannose receptor C-type 1-like B, MHC-II, myeloid markers CD11c, DEC205, and co-stimulatory molecules CD40, CD80, CD86 by MoDCs at different maturation states are assessed by flow cytometry.

Lab equipment

Biosafety cabinet,

Cell incubator,

Microscope,

Centrifuge,

Flow cytometer.

Method status

Still in development

PROS, CONS & FUTURE POTENTIAL

Advantages

- Poorly invasive (MoDCs used in place of bone marrow-derived DCs);
- Makes it possible to assess the response to an antigen in a large number of individuals and thus evaluate individual variability.

Challenges

Antibodies for cell characterization are not all commercially available.

Future & Other applications

- Selection of immunopotentiating agents (e.g. adjuvants) during vaccine development;
- Antigen-pulsed MoDCs will be co-cultured with naïve purified T cells to characterize cell-mediated responses triggered by vaccine candidates *in vitro*.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

References

- Tapia-Calle G, Stoel M, de Vries-Idema J, Huckriede A. Distinctive Responses in an *In Vitro* Human Dendritic Cell-Based System upon Stimulation with Different Influenza Vaccine Formulations. *Vaccines (Basel)* 2017;5(3):21. <https://doi.org/10.3390/vaccines5030021>.
- Kangethe, R. T., Pichler, R., Chuma, F. N. J., Cattoli, G., & Wijewardana, V. Bovine monocyte derived dendritic cell based assay for measuring vaccine immunogenicity *in vitro*. *Veterinary Immunology and Immunopathology* 2018;197,39–48. <https://doi.org/10.1016/j.vetimm.2018.01.009>.
- Wu, Z., Rothwell, L., Young, J. R., Kaufman, J., Butter, C., & Kaiser, P. Generation and characterization of chicken bone marrow-derived dendritic cells. *Immunology* 2010;129(1),133–145. <https://doi.org/10.1111/j.1365-2567.2009.03129.x>.
- Kamble NM, Jawale CV, Lee JH. Activation of chicken bone marrow-derived dendritic cells induced by a *Salmonella Enteritidis* ghost vaccine candidate. *Poultry Science* 2016;95:2274–80. <https://doi.org/10.3382/ps/pew158>.
- Larsen FT, Guldbrandtsen B, Christensen D, Pitcovski J, Kjærup RB, Dalgaard TS.

Pustulan Activates Chicken Bone Marrow-Derived Dendritic Cells *In Vitro* and Promotes *Ex Vivo* CD4+ T Cell Recall Response to Infectious Bronchitis Virus. *Vaccines* (Basel) 2020;8:E226. <https://doi.org/10.3390/vaccines8020226>.

- Van den Biggelaar RHGA, van der Maas L, Meiring HD, Pennings JLA, van Eden W, Rutten VPMG, et al. Proteomic analysis of chicken bone marrow-derived dendritic cells in response to an inactivated IBV + NDV poultry vaccine. *Sci Rep* 2021;11:12666. <https://doi.org/10.1038/s41598-021-89810-3>.

Associated documents

[2023_RE-Place_protocol.pdf](#)

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