HMGB1 molecule and its derived peptides are capable of acting as adjuvant, enhancing the immune response against a peptide antigen and protein (Saenz et al. (2010) Vaccine 28 (47): 7556-7562).

The knowledge about the function of PACAP in the modulation of the fish immune response is limited to studies performed by our research group. We demonstrated that the recombinant *Clarias gariepinus* PACAP administrated by immersion baths or by injection not only promotes growth but also stimulates innate immune parameters (lysozyme, nitric oxide derived metabolites and antioxidant defenses) and acquired immunity (IgM) in larvae and juveniles fish (Carpio et al. (2008) Fish and Shellfish Immunology 25:439-45; Lugo et al. (2010) Fish and Shellfish Immunology 29:513-520). These properties of PACAP were described in the international patent application WO2007/059714, "Neuropéptidos para el cultivo de organismos acuáticos".

At present, in the field of human and veterinary medicine, there is still interest in identifying compounds that may be used as safe and more potent adjuvants that may be incorporated into existing vaccines, and in those which are under development.

Summary

According to a first aspect, there is provided use of the "pituitary adenylate cyclase activating peptide" (PACAP) as a molecular adjuvant for vaccine antigens.

According to a second aspect, there is provided a vaccine composition comprising the "pituitary adenylate cyclase activating peptide" (PACAP), at least one vaccine antigen and pharmaceutically acceptable vehicles or diluents.

According to a third aspect, there is provided a vaccine combination comprising the "pituitary adenylate cyclase activating peptide" (PACAP) and at least one vaccine antigen.

According to a fourth aspect, there is provided a method for increasing the immune response to a vaccine antigen characterized by comprising the use of a composition that comprise the "pituitary adenylate cyclase activating peptide" (PACAP) as an adjuvant for the antigen.

Detailed description of the invention

The present invention solves the above described problem, providing a new alternative of adjuvant capable of strongly potentiate the immune response towards an antigen that is co-administered, and hence it constitutes a highly effective adjuvant. It is an object of the present invention, the use of "pituitary adenylate cyclase activating peptide" (PACAP) as a molecular adjuvant for antigens that are present in vaccines used in different immunization strategies. In one embodiment of the invention said vaccines, comprising PACAP as an adjuvant, are designed for immunization against infectious agents. These infectious agents can be viruses, bacteria and ectoparasites, among others. In a particular embodiment, these infectious agents affect mammals, birds and fish.

The term “pituitary adenylate cyclase activating polypeptide (PACAP)”, as used in the present invention, includes this molecule in any variant (PACAP27 or PACAP38), either isolated from its natural source, produced by chemical synthesis, or produced by recombinant DNA technology; and it includes its use as a peptide or in the form of nucleic acids.