

Peptide Vaccines and their use for the Treatment of Breast Cancer



Lorena GONZÁLEZ*, Manoli IGARTUA¹, Rosa HERNÁNDEZ¹ and Aiala SALVADOR¹

¹ NanoBioCel Group, Lab. of Pharmaceutics, Faculty of Pharmacy, University of the Basque Country (UPV/EHU), Vitoria-Gasteiz, Spain.

INTRODUCTION

Among all cancers, breast cancer is the most frequent in women, and the one that causes more deaths. Every year, breast cancer incidence rates increase, what means that 1/8 woman will develop breast cancer in some point of their life.

Several techniques have been developed and are used for the treatment of breast-cancer, and despite their effectiveness, they also cause a wide variety of adverse effects that the patient has to suffer. The problems of most treatments are the low specificity, which causes the damage of healthy tissue, and the uselessness in late state disease. To overcome these issues, a new treatment line called immunotherapy has appeared. This therapy aims to restore the effectiveness of the immune system (IS), so that tumor cells can be eliminated as in a healthy body.

Therefore, the purpose of this end of degree project has been to review one of the main strategies in cancer immunotherapy. In this review, we have focused on **peptide-based vaccines**, one of the main strategies in cancer immunotherapy, and also in the different **tumor microenvironments** that we can find, since they are the main barrier to overcome for an effective treatment.

TUMOR MICROENVIRONMENT

Mutated or damaged cells are normally eliminated by the immune system as they express abnormal antigens on their surface. If the recognition fails, these cells can proliferate and develop a wide variety of escape mechanisms which help them expand and grow without been detected.

Depending on the escape mechanisms developed, 3 tumor microenvironment are distinguished:

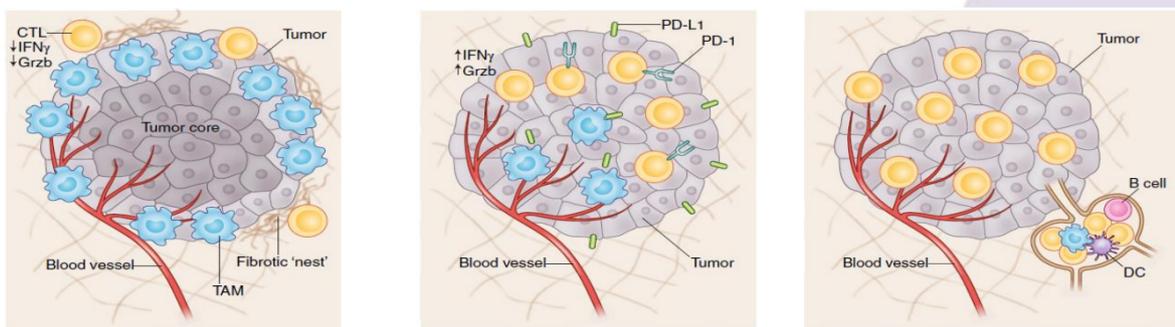


Figure (1): 1. Infiltrated- excluded 2. Infiltrated-inflamed 3. Infiltrated-TLS

Knowing the tumor type we are facing, the best treatment for it can be chosen.

PEPTIDE-BASED VACCINES

With the administration of tumor antigens, the immune system can recognize mutated antigens away from the immunosuppressive environment, and can be activated and proliferate against tumor cells.

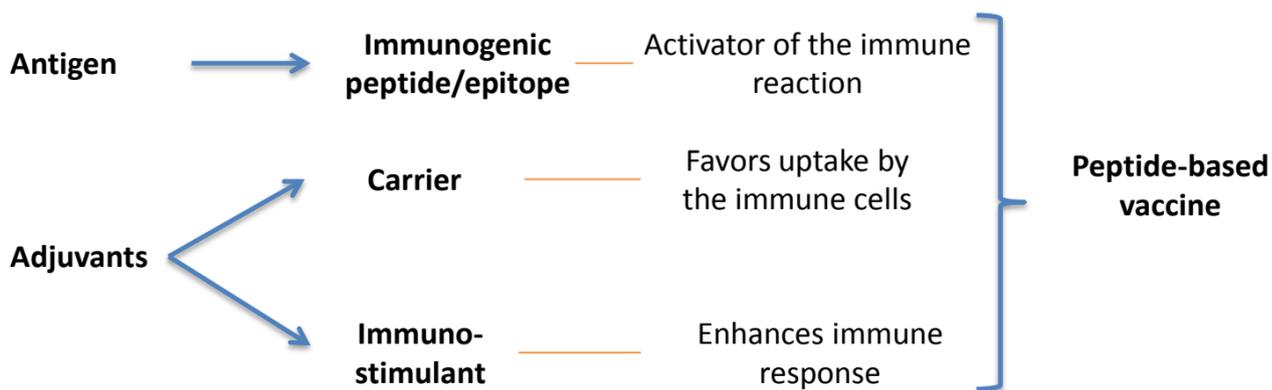


Table: List of peptide-based vaccines in latest phases of clinical trials.

Vaccine	Antigen	Epitope	Carrier	Immuno-stimulant	Phase
NeuVax® (2)	HER2/neu	E75		GM-CSF	III. Phase finished
	HER2/neu	GP2		GM-CSF	II. phase
	HER2/neu	AE37		GM-CSF	II. phase
Stimuvax® (3)	MUC1	BLP25	Liposome	MPL	III. phase
	P53			IL-2	I/II. phase
	Neoantigen		Montanide ISA-51		II. phase

CONCLUSIONS

- Peptide-based vaccines will be soon to be used in clinic.
- Peptide-based vaccines have to be administered with another treatment (chemotherapy, monoclonal antibodies...) in order to increase their effectiveness.
- Understanding tumor microenvironment is a key factor, but further research is needed to improve immunotherapy strategies.

Bibliography:

- (1) Binnewies M, Roberts EW, Kersten K, Chan V, Fearon DF, Merad M, et al. Nat Med 2018 May;24(5):541-550.
 (2) Clifton GT, Gall V, Peoples GE, Mittendorf EA.. Breast Care (Basel) 2016 Apr;11(2):116-121.
 (3) Kable Intelligence Limited. Stimuvax – Investigational Therapeutic Cancer Vaccine.