



Effect of Egg Derived Bioactive Peptides on Vascular Inflammation

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Background

Cardiovascular disease is one of the leading cause of morbidity and mortality, worldwide. Inflammation in blood vessel or vascular inflammation is an auto immune disorder which is a primary cause of various other cardiovascular diseases such as atherosclerosis, hypertension etc.

The inner most cellular layer of blood vessels are made off by endothelium cells, which express the regulatory proteins of vascular inflammation.

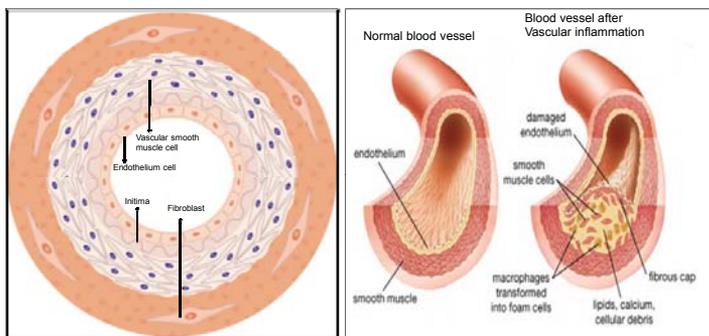


Fig 1: Cross sectional view of blood vessel.

Fig 2: Inner physiology of human blood vessel at inflammatory condition.

Encyclopedia Britannica 2007

In a diseased condition damaged endothelium expressed two regulatory proteins on the cell surface, those are, vascular-cellular adhesion molecule-1 (VCAM-1) and inter-cellular adhesion molecule-2 (ICAM-1).

In our previous study we found three potent short active fragment of protein or bioactive peptides (IRW, IQW and LKP) from egg white protein ovotransferrin. These peptides exhibited potent antihypertensive activity.

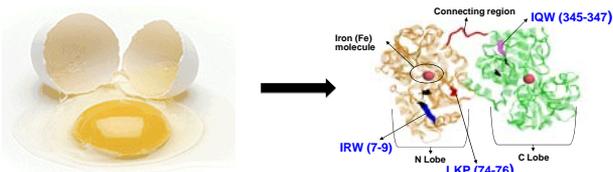


Fig 3: Molecular structure of egg white protein ovotransferrin and the bioactive peptides (IRW, IQW and LKP) are marked in the structure.

Hypothesis

Three bioactive peptides (IRW, IQW and LKP) derived from egg protein ovotransferrin may reduce vascular inflammation.

Objective

Vascular inflammatory molecules are the key players of the vascular inflammation, which expressed in the surface of the activated endothelium cells. The endothelium cells are often activated by various cytokines such as Tumor Necrosis Factor (TNF).

Therefore, the main aim of this experiment was to check the expression of vascular inflammatory molecules (ICAM-1 and VCAM-1) in the presence and absence of egg proteins derived bioactive peptides (IRW, IQW and LKP) on activated endothelium cells.

Experimental Design

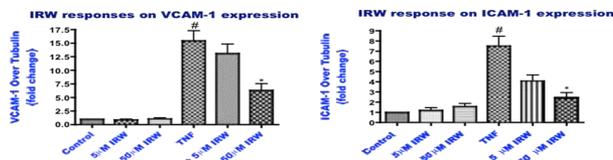
- Human Umbilical Vein Endothelium Cells (HUVECs) were isolated from human umbilical chords collected from the new born baby and cultured on the lab condition.
- These cells were then pretreated by these three bioactive peptides (IRW, IQW and LKP) and then simulated by TNF.
- After simulation the expression of the ICAM-1 and VCAM-1 was checked by the western blot analysis.



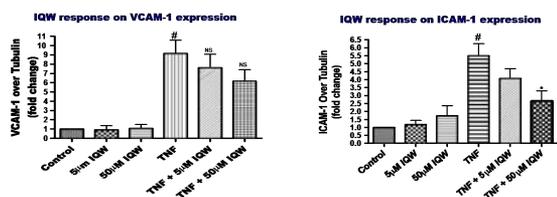
Fig 4: Human Umbilical Vein Endothelium Cells (HUVECs) were isolated and cultured in the lab condition.

Results

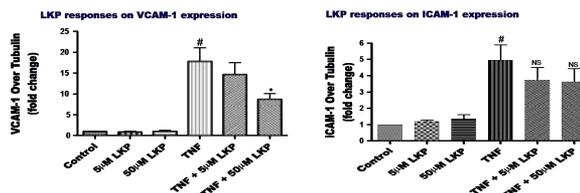
Effect of peptide IRW on TNF induced HUVECs



Effect of peptide IQW on TNF induced HUVECs



Effect of peptide LKP on TNF induced HUVECs



Conclusion

- Egg protein ovotransferrin derived peptides (IRW, IQW and LKP) can reduce vascular inflammation through inhibiting the expression of the inflammatory molecules ICAM-1 and VCAM-1.
- Peptide IRW can significantly reduce the expression of the both inflammatory molecules ICAM-1 and VCAM-1, IQW can significantly reduce the expression of ICAM-1 but not VCAM-1 and LKP can significantly reduce the expression of VCAM-1 but not ICAM-1.
- These peptides can be used for the development of nutraceuticals which will open a new path for the egg industries.

Acknowledgement