

SUMMARY

The present inventors have surprisingly found peptides able to bind to a specific site on the N-terminal portion of IL-17A and thereby to inhibit the interaction with IL-17RA and the formation of the IL-17A/IL-17RA/IL-17RC complex.

The inhibition of said interaction blocks the IL-17A signaling pathway. The peptides according to the disclosure are therefore able to reduce TH17-related inflammation and the subsequent damage observed in inflammatory and autoimmune diseases where these cells and IL-17A exert a pivotal role.

In one aspect, the present disclosure refers to a peptide, able to inhibit IL-17A binding to IL-17RA, ~~having consisting of~~ the amino acid sequence of ~~either:~~

formula (I):

(I) $X_1-X_2-X_3-X_4-X_5-X_6-X_7-X_8-X_9-X_{10}-X_{11}-X_{12}-X_{13}-X_{14}-X_{15}$

wherein, independently from each other:

X₁ is I, V, D, K, W, A, G, L or P;

X₂ is H, M, K, N, R, E, Q, W or Y;

X₃ is V, F, A, G, L, P, I, Y or W;

X₄ is T, Q, H, S, N or Y;

X₅ is I, F, A, G, L, P, V or Y;

X₆ is P, G, A, L, V, I or N;

X₇ is A, Q, G, L, P, V, I, N or E;

X₈ is D, E, N, Q or Y;

X₉ is L, V, F, W, A, G, P, I or H;

X₁₀ is W, Y, F or Q or it is absent;

X₁₁ is D, E or N or it is absent;

X₁₂ is W, F, V, H or Y or it is absent;

X₁₃ is I, V, F, E, K, A, G, L, P or Y or its absent;

X₁₄ is N, R, E, F, Q or D or it is absent;

X₁₅ is K, R, E, F, V, W, H or D or it is absent;

with the proviso that said sequence is not IHVTIPADLWDWINK (SEQ ID ~~N-NO:~~ 1) or IHVTIPADLWDWIN, IHVTIPADLWDWI or IHVTIPADLWDW;

~~or formula (II):~~

~~a_n-DLSAVCWAFPWDPECH-b_n~~

~~wherein, independently from each other:~~

~~a, b are selected from A, R, N, D, C, E, Q, G, H, I, L, K, M, F, P, S, T, W, Y or V;~~

~~n = integer from 0 to 3;~~

~~n' = integer from 0 to 3.~~

In another aspect, the present disclosure refers to ~~a~~the peptide having an amino_{acid} sequence consisting of the sequence of a peptide as disclosed herein and at the C- and/or N- terminal of ~~said sequence a sequence~~ Sequence A having the amino_{acid} sequence of formula (III):

(III) Y₁-Y₂-Y₃- Y₄-Y₅-Y₆- Y₇-Y₈-Y₉- Y₁₀-Y₁₁-Y₁₂- Y₁₃-Y₁₄-Y₁₅-Y₁₆

wherein:

Y₁ is A, T, V, K, R, I, L, X or G;

Y₂ is R, W, P, E, Q or A;

Y₃ is K, W, G, T, I, R or P;

Y₄ is K, T, E, W, A, R, D, G, X or F;

Y₅ is A, E, T, G, W, I, R, P or V;

Y₆ is A, W, E, R, G, P or absent;

Y₇ is K, S, W, T, F, R, V, G or absent;

Y₈ is A, Q, W, R, G or absent;

Y₉ is N, G or absent;

Y₁₀ is R or absent;

Y₁₁ is R or absent;

Y₁₂ is M or absent;

Y₁₃ is K or absent.

Y₁₄ is W or absent;

Y₁₅ is K or absent;

Y₁₆ is K or absent.

In another aspect, the present disclosure refers to ~~a~~the peptide having an amino_{acid} sequence consisting of the sequence of a peptide as disclosed herein and at the C- and/or N- terminal of ~~said sequence~~ a sequence (A)_m, wherein A is an aminoacid selected from R, K, G, E, Q or A, preferably R, K, G, E or A, and m is an integer between 1 and 10.

In another aspect, the present disclosure refers to dimer formed by two peptides as disclosed herein.

In another aspect, the present disclosure refers to bioconjugate comprising a peptide as disclosed herein and a biomolecule, preferably said molecule being bound to the N- and/or C- terminal of said peptide.

In another aspect, the present disclosure refers to pharmaceutical composition comprising a peptide as disclosed herein, a dimer as disclosed herein, a bioconjugate as disclosed herein and at least one pharmaceutically acceptable excipient.

Claims

1. A peptide, able to inhibit IL-17A binding to ILRA, ~~having~~consisting of the amino_acid sequence of ~~either:~~

formula (I):

(I) $X_1-X_2-X_3-X_4-X_5-X_6-X_7-X_8-X_9-X_{10}-X_{11}-X_{12}-X_{13}-X_{14}-X_{15}$

wherein, independently from each other:

X₁ is I, V, D, K, W, A, G, L or P;

X₂ is H, M, K, N, R, E, Q, W or Y;

X₃ is V, F, A, G, L, P, I, Y or W;

X₄ is T, Q, H, S, N or Y;

X₅ is I, F, A, G, L, P, V or Y;

X₆ is P, G, A, L, V, I or N;

X₇ is A, Q, G, L, P, V, I, N or E;

X₈ is D, E, N, Q or Y;

X₉ is L, V, F, W, A, G, P, I or H;

X₁₀ is W, Y, F or Q or it is absent;

X₁₁ is D, E or N or it is absent;

X₁₂ is W, F, V, H or Y or it is absent;

X₁₃ is I, V, F, E, K, A, G, L, P or Y or its absent;

X₁₄ is N, R, E, F, Q or D or it is absent;

X₁₅ is K, R, E, F, V, W, H or D or it is absent;

with the proviso that said sequence is not IHVTIPADLWDWINK (~~SEQ ID NO:~~SEQ ID NO: 1) or

IHVTIPADLWDWIN, IHVTIPADLWDWI or IHVTIPADLWDW;

~~or formula (II):~~

~~(II) — a_n-DLSAVCWAFPWDPECH-b_n~~

~~wherein, independently from each other:~~

~~a, b are selected from A, R, N, D, C, E, Q, G, H, I, L, K, M, F, P, S, T, W, Y or V;~~

~~n = integer from 0 to 3;~~

~~n' = integer from 0 to 3.~~

2. ~~A~~The peptide as claimed in claim 1, wherein in said formula (I):

X₁ is I, V, A, G, L, or P;

X₂ is H, M, K, R, E, Q, W or Y;

X₃ is V, F, A, G, L, P, I, Y or W;

X₄ is T, Q, S, N or Y;

X₅ is I, F, A, G, L, P, V or Y;

X₆ is P, G, A, L, V, I or N;

X₇ is A, Q, G, L, P, V, I, N or E;

X₈ is D, E, N, Q or Y;

X₉ is L, V, F, W, A, G, P, I or H;

X₁₀ is W, Y, F or Q or it is absent;

X₁₁ is D, E or N or it is absent;

X₁₂ is W, F, H or Y or it is absent;

X₁₃ is I, V, F, E, K, A, G, L, P or Y or its absent;

X₁₄ is N, R, E, Q or D or it is absent;

X₁₅ is K, R, E, V, W, H or D or it is absent;

with the proviso that said sequence is not IHVTIPADLWDWINK (~~SEQ ID N:~~SEQ ID NO: 1),

IHVTIPADLWDWIN, IHVTIPADLWDWI or IHVTIPADLWDW.

3. ~~A~~The peptide as claimed in claim 1 or 2, having a 15 amino_acid sequence.

4. ~~A~~The peptide as claimed in claims 1 to 3, wherein in said formula (I):

X₁ is I, V or L;

X₂ is H, M, R, K or E;

X₃ is V, F or I;

X₄ is T, Q, S, Y or N;

X₅ is I, F or V;

X₆ is P;

X₇ is A, Q, or L;

X₈ is D, E, or Q;

X₉ is L, W, F, V or I;

X₁₀ is W, Y or F;

X₁₁ is D, E or N;

X₁₂ is W or F;

X₁₃ is I, V, F or L;

X₁₄ is N, R, Q or E;

X₁₅ is K, R, H or E;

with the proviso that said sequence is not IHVTIPADLWDWINK (~~SEQ ID NO: 1~~);

or

X₁ is I or V;

X₂ is H, M or R,

X₃ is V or F;

X₄ is T or Q;

X₅ is I, F or V;

X₆ is P or G;

X₇ is A or Q;

X₈ is D or E;

X₉ is L;

X₁₀ is W or Y;

X₁₁ is D or E;

X₁₂ is W;

X₁₃ is I or V;

X₁₄ is N, R or E;

X₁₅ is K, R or E;

with the proviso that said sequence is not IHVTIPADLWDWINK (~~SEQ ID N:~~SEQ ID NO: 1);

or

X₁ is I or V;

X₂ is H or M,

X₃ is V;

X₄ is T;

X₅ is I;

X₆ is P;

X₇ is A;

X₈ is D;

X₉ is L, W, F, V or I;

X₁₀ is W or Y;

X₁₁ is D or E;

X₁₂ is W;

X₁₃ is I or V;

X₁₄ is N, R or E;

X₁₅ is K, R or E;

with the proviso that said sequence is not IHVTIPADLWDWINK (~~SEQ ID N:~~SEQ ID NO: 1);

or

or

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is V, A, G, L, or P;~~

~~X₂ is M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is V, A, G, L, or P;~~

~~X₂ is M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L or P;~~

~~X₂ is M, K, N, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L or P;~~

~~X₂ is H, M, K, N, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is V, A, G, L or P;~~

~~X₂ is M, K, N, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

or

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is Y, F or Q;~~

~~X₁₁ is E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is N, R, E, Q or D;~~

~~X₁₅ is K, R, E, V, W, H or D;~~

~~or~~

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is R, E, Q or D;~~

~~X₁₅ is R, E, V, W, H or D;~~

~~or~~

~~X₁ is V, A, G, L, or P;~~

~~X₂ is H, M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is R, E, Q or D;~~

~~X₁₅ is R, E, V, W, H or D;~~

~~or~~

~~X₁ is I, V, A, G, L, or P;~~

~~X₂ is M, K, R, E, Q, W or Y;~~

~~X₃ is V, F, A, G, L, P, I, Y or W;~~

~~X₄ is T, Q, S, N or Y;~~

~~X₅ is I, F, A, G, L, P, V or Y;~~

~~X₆ is P, G, A, L, V, I or N;~~

~~X₇ is A, Q, G, L, P, V, I, N or E;~~

~~X₈ is D, E, N, Q or Y;~~

~~X₉ is L, V, F, W, A, G, P, I or H;~~

~~X₁₀ is W, Y, F or Q;~~

~~X₁₁ is D, E or N;~~

~~X₁₂ is W, F, H or Y;~~

~~X₁₃ is I, V, F, E, K, A, G, L, P or Y;~~

~~X₁₄ is R, E, Q or D;~~

~~X₁₅ is R, E, V, W, H or D;~~

5. ~~A~~The peptide as claimed in claims 1 to 4, wherein in formula (I) X₁ is V.

6. ~~A~~The peptide of formula (I) as claimed in claim 1 or 2, having an amino_{acid} sequence selected from ~~SEQ ID N:SEQ ID NO: 2, SEQ ID N:SEQ ID NO: 3, SEQ ID N:SEQ ID NO: 4, SEQ ID N:SEQ ID NO: 5, SEQ ID N:SEQ ID NO: 6, SEQ ID N:SEQ ID NO: 7, SEQ ID N:SEQ ID NO: 8, SEQ ID N:SEQ ID NO: 9, SEQ ID N:SEQ ID NO: 10, SEQ ID N:SEQ ID NO: 11, SEQ ID N:SEQ ID NO: 12, SEQ ID N:SEQ ID NO: 13, SEQ ID N:SEQ ID NO: 14, SEQ ID N:SEQ ID NO: 15, SEQ ID N:SEQ ID NO: 16, SEQ ID N:SEQ ID NO: 17, SEQ ID N:SEQ ID NO: 18, SEQ ID N:SEQ ID NO: 42, SEQ ID N:SEQ ID NO: 111, SEQ ID N:SEQ ID NO: 112, SEQ ID N:SEQ ID NO: 113, SEQ ID N:SEQ ID NO: 114, SEQ ID N:SEQ ID NO: 115, SEQ ID N:SEQ ID NO: 116, SEQ ID N:SEQ ID NO: 117, SEQ ID N:SEQ ID NO: 118, SEQ ID N:SEQ ID NO: 119, SEQ ID N:SEQ ID NO: 120, SEQ ID N:SEQ ID NO: 121, SEQ ID N:SEQ ID NO: 122, SEQ ID N:SEQ ID NO: 123, SEQ ID N:SEQ ID NO: 124, SEQ ID N:SEQ ID NO: 125,~~

~~SEQ ID N:SEQ ID NO: 126, SEQ ID N:SEQ ID NO: 127, SEQ ID N:SEQ ID NO: 128, SEQ ID N:SEQ ID NO: 129, SEQ ID N:SEQ ID NO: 130, SEQ ID N:SEQ ID NO: 131, SEQ ID N:SEQ ID NO: 132, SEQ ID N:SEQ ID NO: 133, SEQ ID N:SEQ ID NO: 134, SEQ ID N:SEQ ID NO: 135, SEQ ID N:SEQ ID NO: 136, SEQ ID N:SEQ ID NO: 137, SEQ ID N:SEQ ID NO: 138, SEQ ID N:SEQ ID NO: 139, SEQ ID N:SEQ ID NO: 140, SEQ ID N:SEQ ID NO: 141, SEQ ID N:SEQ ID NO: 142, SEQ ID N:SEQ ID NO: 143, SEQ ID N:SEQ ID NO: 144, SEQ ID N:SEQ ID NO: 145, SEQ ID N:SEQ ID NO: 146, SEQ ID N:SEQ ID NO: 147, SEQ ID N:SEQ ID NO: 148, SEQ ID N:SEQ ID NO: 149, SEQ ID N:SEQ ID NO: 150, SEQ ID N:SEQ ID NO: 151, SEQ ID N:SEQ ID NO: 152, SEQ ID N:SEQ ID NO: 153, SEQ ID N:SEQ ID NO: 154, SEQ ID N:SEQ ID NO: 155, SEQ ID N:SEQ ID NO: 158, SEQ ID N:SEQ ID NO: 159, SEQ ID N:SEQ ID NO: 160, SEQ ID N:SEQ ID NO: 161, SEQ ID N:SEQ ID NO: 162, SEQ ID N:SEQ ID NO: 163, SEQ ID N:SEQ ID NO: 164, SEQ ID N:SEQ ID NO: 165, SEQ ID N:SEQ ID NO: 166, SEQ ID N:SEQ ID NO: 167, SEQ ID N:SEQ ID NO: 168,, SEQ ID N:SEQ ID NO: 169, SEQ ID N:SEQ ID NO: 170, SEQ ID N:SEQ ID NO: 171, SEQ ID N:SEQ ID NO: 172, SEQ ID N:SEQ ID NO: 173, SEQ ID N:SEQ ID NO: 174, SEQ ID N:SEQ ID NO: 175, SEQ ID N:SEQ ID NO: 176, SEQ ID N:SEQ ID NO: 177, SEQ ID N:SEQ ID NO: 178, SEQ ID N:SEQ ID NO: 179, SEQ ID N:SEQ ID NO: 180, SEQ ID N:SEQ ID NO: 181, SEQ ID N:SEQ ID NO: 182, SEQ ID N:SEQ ID NO: 183, SEQ ID N:SEQ ID NO: 184, SEQ ID N:SEQ ID NO: 185, SEQ ID N:SEQ ID NO: 186, SEQ ID N:SEQ ID NO: 187, SEQ ID N:SEQ ID NO: 188, SEQ ID N:SEQ ID NO: 189, SEQ ID N:SEQ ID NO: 190, SEQ ID N:SEQ ID NO: 191, SEQ ID N:SEQ ID NO: 192, SEQ ID N:SEQ ID NO: 193, SEQ ID N:SEQ ID NO: 194, SEQ ID N:SEQ ID NO: 195, SEQ ID N:SEQ ID NO: 196, SEQ ID N:SEQ ID NO: 197, SEQ ID N:SEQ ID NO: 198, SEQ ID N:SEQ ID NO: 200, SEQ ID N:SEQ ID NO: 201, SEQ ID N:SEQ ID NO: 202, SEQ ID N:SEQ ID NO: 203, SEQ ID N:SEQ ID NO: 204, SEQ ID N:SEQ ID NO: 205, SEQ ID N:SEQ ID NO: 206, SEQ ID N:SEQ ID NO: 207, SEQ ID N:SEQ ID NO: 208, SEQ ID N:SEQ ID NO: 209, SEQ ID~~

~~N-SEQ ID NO: 210, SEQ ID N-SEQ ID NO: 211, SEQ ID N-SEQ ID NO: 212, SEQ ID N-SEQ ID NO: 213, SEQ ID N-SEQ ID NO: 214, SEQ ID N-SEQ ID NO: 215, SEQ ID N-SEQ ID NO: 216, SEQ ID N-SEQ ID NO: 217, SEQ ID N-SEQ ID NO: 218, SEQ ID N-SEQ ID NO: 219, SEQ ID N-SEQ ID NO: 220, SEQ ID N-SEQ ID NO: 221, SEQ ID N-SEQ ID NO: 222, SEQ ID N-SEQ ID NO: 223, SEQ ID N-SEQ ID NO: 224, SEQ ID N-SEQ ID NO: 225, SEQ ID N-SEQ ID NO: 226, SEQ ID N-SEQ ID NO: 227, SEQ ID N-SEQ ID NO: 228, SEQ ID N-SEQ ID NO: 229, SEQ ID N-SEQ ID NO: 230, SEQ ID N-SEQ ID NO: 231, SEQ ID N-SEQ ID NO: 232, SEQ ID N-SEQ ID NO: 233, SEQ ID N-SEQ ID NO: 234, SEQ ID N-SEQ ID NO: 235, SEQ ID N-SEQ ID NO: 236, SEQ ID N-SEQ ID NO: 237, SEQ ID N-SEQ ID NO: 238, SEQ ID N-SEQ ID NO: 239, SEQ ID N-SEQ ID NO: 240, SEQ ID N-SEQ ID NO: 241, SEQ ID N-SEQ ID NO: 242, SEQ ID N-SEQ ID NO: 243, SEQ ID N-SEQ ID NO: 244, SEQ ID N-SEQ ID NO: 245, SEQ ID N-SEQ ID NO: 246, SEQ ID N-SEQ ID NO: 247, SEQ ID N-SEQ ID NO: 248, SEQ ID N-SEQ ID NO: 249, SEQ ID N-SEQ ID NO: 250, SEQ ID N-SEQ ID NO: 251, SEQ ID N-SEQ ID NO: 252, SEQ ID N-SEQ ID NO: 253, SEQ ID N-SEQ ID NO: 254, SEQ ID N-SEQ ID NO: 255, SEQ ID N-SEQ ID NO: 256, SEQ ID N-SEQ ID NO: 257.~~

7. A-The peptide having an amino_{acid} sequence consisting of the sequence of a peptide as claimed in claims 1 to 6 and at the C- and/or N- terminal of ~~said sequence a sequence~~ Sequence A having the amino_{acid} sequence of formula (III):

(III) Y₁-Y₂-Y₃- Y₄-Y₅-Y₆- Y₇-Y₈-Y₉- Y₁₀-Y₁₁-Y₁₂- Y₁₃-Y₁₄-Y₁₅-Y₁₆

wherein:

Y₁ is A, T, V, K, R, I, L, X or G;

Y₂ is R, W, P, E, Q or A;

Y₃ is K, W, G, T, I, R or P;

Y₄ is K, T, E, W, A, R, D, G, X or F;

Y₅ is A, E, T, G, W, I, R, P or V;

Y₆ is A, W, E, R, G, P or absent;

Y₇ is K, S, W, T, F, R, V, G or absent;

Y₈ is A, Q, W, R, G or absent;

Y₉ is N, G or absent;

Y₁₀ is R or absent;

Y₁₁ is R or absent;

Y₁₂ is M or absent;

Y₁₃ is K or absent.

Y₁₄ is W or absent;

Y₁₅ is K or absent;

Y₁₆ is K or absent.

8. AThe peptide as claimed in claim 7, having sequence of ~~SEQ ID N:SEQ ID NO:~~ 21, ~~SEQ ID N:SEQ ID NO:~~ 22, ~~SEQ ID N:SEQ ID NO:~~ 23, ~~SEQ ID N:SEQ ID NO:~~ 24, ~~SEQ ID N:SEQ ID NO:~~ 25, ~~SEQ ID N:SEQ ID NO:~~ 26, ~~SEQ ID N:SEQ ID NO:~~ 27, ~~SEQ ID N:SEQ ID NO:~~ 28, ~~SEQ ID N:SEQ ID NO:~~ 31, ~~SEQ ID N:SEQ ID NO:~~ 32, ~~SEQ ID N:SEQ ID NO:~~ 33 ~~SEQ ID N:SEQ ID NO:~~ 34, ~~SEQ ID N:SEQ ID NO:~~ 35, ~~SEQ ID N:SEQ ID NO:~~ 36, SEQ ID NO: 37, SEQ ID NO: 38, SEQ ID NO: 39, SEQ ID NO: 40.

9. AThe peptide having an amino_{acid} sequence consisting of the sequence of a peptide as claimed in claims 1 to 6 and at the C- and/or N- terminal of ~~said sequence a~~ sequence (A)_m, wherein A is an amino_{acid} selected from R, K, G, E, Q or A, preferably R, K, G, E or A, and m is an integer between 1 and 10.

10. AThe peptide as claimed in claim 9, having sequence of ~~SEQ ID N:SEQ ID NO:~~ 19, ~~SEQ ID N:SEQ ID NO:~~ 20, ~~SEQ ID N:SEQ ID NO:~~ 29, ~~SEQ ID N:SEQ ID NO:~~ 30, ~~SEQ ID N:SEQ ID NO:~~ 43.

11. A peptide as claimed in claims 1 to 10, bound at the C- and/or N- terminal to a protective cap group, preferably the protective cap group bound to a C-terminal being selected from amides, aldehydes, esters, p-Nitroanilide, 7-Amino-4-methylcoumarin and the protective group cap bound to a N-terminal being selected from acetyl, formyl, pyroglutamyl, fatty acids, urea, carbamate sulfonamide, alkylamine.

12. The peptide of claim 1, comprising an amino acid sequence of SEQ ID NO: 2.

~~12-13.~~ Dimer formed by two peptides as claimed in claims 1 to ~~11-12.~~

~~13-14.~~ Dimer as claimed in claim ~~12-13.~~, wherein said peptides are linked by a polyethylene spacer.

~~14-15.~~ Bioconjugate comprising a peptide as claimed in claims 1 to ~~10-12.~~ and a biomolecule, preferably said molecule being bound to the N- and/or C- terminal of said peptide.

~~15-16.~~ Bioconjugate as claimed in claim ~~14-15.~~ wherein said biomolecule is preferably selected from capric acid, capronic acid, ascorbic acid, N-Acetyl-Glucosamine (NAG), N-Acetylmuramic acid (NAM), NAG, NAM, hyaluronic acid, alginic acid, chitin, (GalNAc)₂, Gal-alpha1,3-GalNAc and trigalacturonic acid.

~~16-17.~~ Pharmaceutical composition comprising a peptide as claimed in claims 1 to ~~11-12.~~, a dimer as claimed in claims ~~12-13.~~ or ~~13-14.~~, a bioconjugate as claimed in claims ~~14-15.~~ or ~~15-16.~~ and at least one pharmaceutically acceptable excipient.

~~17-18.~~ Use of a peptide as claimed in claims 1 to ~~11-12.~~, a dimer as claimed in claims ~~12-13.~~ or ~~13-14.~~ or a bioconjugate as claimed in claims ~~14-15.~~ or ~~15-16.~~, in the manufacture of a medicament for treating and/or preventing a disease selected from rheumatoid arthritis, multiple sclerosis, Crohn's disease, systemic lupus erythematosus, asthma, Behçet's disease, hyper IgE syndrome, ankylosing spondylitis, psoriasis, psoriatic arthritis, rheumatoid arthritis, keratoconjunctivitis sicca, vernal keratoconjunctivitis, stromal herpetic keratitis, corneal

allograft rejection, corneal infections, herpes virus or *Pseudomonas aeruginosa* keratitis and dry eye disease, preferably psoriasis or dry eye disease.