

CLAIMS:

1. An isolated polypeptide comprising or consisting of a peptide comprising or consisting of a glycine and arginine-rich (GAR/RGG) region with alarmin and/or cell penetrating activity.
2. The isolated peptide of claim 1, wherein the glycine and arginine-rich (GAR/RGG) region of the peptide comprises or consists of a plurality of amino acid trimers selected from the group comprising RGG, GGR, FGG and GGF and/or tetramers selected from the group comprising RGGG, GGGR, FGGG and GGGF.
3. The isolated polypeptide of claim 2, wherein the glycine and arginine-rich (GAR/RGG) region of the peptide further comprises tetramers selected from the group comprising RGGG, GGGR, FGGG and GGGF and/or intervening amino acids selected from the group comprising RG, GR, FR and GDR.
4. The isolated peptide of any one of claims 1 to 3, wherein the peptide is selected from the group comprising or consisting of SEQ ID NO: 1, SEQ ID NO: 2, SEQ ID NO: 3, or an alarmin-active and/or cell-penetrating fragment or mutant thereof.
5. The isolated peptide of any one of claims 1 to 4, wherein the peptide comprises or consists of an amino acid sequence set forth in the group comprising or consisting of SEQ ID NO: 4, SEQ ID NO: 5, SEQ ID NO: 6 and SEQ ID NO: 47, or an alarmin-active and/or cell-penetrating fragment or mutant thereof.
6. The isolated peptide of claim 5, wherein the peptide mutant comprises an insertion of one or more 'G' residues within the GAR/RGG region to complete a triplet, such as "RGRGG" to "RGGRGG", or "RGGFRGG" to "RGGFGGRGG".
7. The isolated peptide of claim 5 or 6, wherein the peptide or mutant thereof consists of an amino acid sequence set forth in the group comprising or consisting of SEQ ID NO: 7, SEQ ID NO: 8, SEQ ID NO: 9, SEQ ID NO: 10, SEQ ID NO: 11, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 14, SEQ ID NO: 20, SEQ ID NO: 21, SEQ ID NO: 22, SEQ ID NO: 23, SEQ ID NO: 24, SEQ ID NO: 53, SEQ ID NO: 54, SEQ ID NO: 55 and SEQ ID NO: 56.
8. The isolated peptide of any one of claims 1 to 7, wherein the peptide or mutant thereof has both alarmin activity and cell-penetrating activity.
9. The isolated peptide of claim 8, wherein the peptide consists of an amino acid sequence set forth in the group comprising SEQ ID NO: 7, SEQ ID NO: 8, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 53 and SEQ ID NO: 54.

10. The isolated peptide of claim 8, wherein the peptide has carrier function and consists of an amino acid sequence set forth in the group comprising SEQ ID NO: 21, SEQ ID NO: 23 and SEQ ID NO: 24.
11. An isolated fusion polypeptide comprising the isolated peptide of any one of claims 1 to 10, fused to an antigen or cargo molecule.
12. The isolated fusion polypeptide of claim 11, wherein the peptide can penetrate cells and carry an antigen or cargo molecule into said cells.
13. The isolated fusion polypeptide of any one of claims 10 to 12, wherein the cells are dendritic cells or other antigen-presenting cells.
14. The isolated fusion polypeptide of any one of claims 10 to 13, wherein the at least one antigen is specific to a pathogen, such as a bacterium, fungus, parasite or virus, or to a cancer cell.
15. The isolated fusion polypeptide of any one of claims 10 to 13, wherein the cargo molecule is a drug or labelling molecule.
16. A composition comprising:
- a) an isolated peptide of any one of claims 1 to 10 and at least one antigen; or
 - b) an isolated fusion polypeptide of any one of claims 11 to 15, or
 - c) an inactivated cancer cell and at least one peptide of any one of claims 1 to 12 or 14, and one or more of a pharmaceutically acceptable excipient, diluent or carrier, or a mixture thereof.
17. A method of enhancing the immunogenicity of an antigen, wherein the antigen is specific to a pathogen, such as a bacterium, fungus, parasite or virus, or to a cancer cell, comprising
- a) fusing an isolated alarmin peptide of any one of claims 1 to 9 with said antigen; or
 - b) mixing an isolated alarmin peptide of any one of claims 1 to 9 with said antigen.
18. Use of an isolated peptide of any one of claims 1 to 9, a fusion polypeptide of any one of claims 10 to 15, or a composition of claim 16, for the manufacture of a medicament for the prophylaxis or treatment of a disease, wherein the disease is selected from the group comprising viral, fungal, parasitic, bacterial and cancer disease.
19. A method of prophylaxis or treatment of a subject in need of such treatment, comprising administering to the subject:

a) an isolated alarmin peptide of any one of claims 1 to 9 fused to or mixed with an antigen or cargo molecule; or

b) a composition of claim 16.

20. A method of activating at least one dendritic cell or other antigen presenting cell, or T cell,
5 or cancer cell, comprising exposing said at least one dendritic cell, antigen presenting cell, or T cell, or cancer cell, to an isolated peptide of any one of claims 1 to 9, or to said peptide fused to or mixed with an antigen or cargo molecule.

21. An isolated polynucleotide which encodes the peptide of any one of claims 1-9, or encodes the fusion polypeptide of any one of claims 10 to 14.

10 22. A cloning or expression vector comprising one or more polynucleotides of claim 21.

23. A process for the production of a peptide of any one of claims 1 to 9, or a fusion polypeptide of any one of claims 10 to 14, comprising culturing a host cell, or cell-free polypeptide manufacturing composition, comprising an expression vector of claim 22 and isolating the said peptide or fusion polypeptide.

15 24. A method of detecting GAR/RGG-containing peptides in a subject, comprising the steps;

i) providing a biological sample from said subject;

ii) determining a level of GAR/RGG-containing proteins present in said biological sample.

25. The method of claim 24, wherein the subject has an autoimmune disease, wherein a level of GAR/RGG-containing peptides above a control level indicates an autoimmune disease in
20 the subject.

26. The method of claim 24 or 25, comprising contacting the sample in i) with an antibody specific for a GAR/RGG region of said GAR/RGG-containing peptide, such as NCL, FBRL or GAR1, or bioactive GAR/RGG region mutants thereof.

27. The method of any one of claims 24 to 26, wherein the biological sample is selected from
25 the group comprising blood, cerebrospinal fluid and urine.

28. A method of enhancing the intracellular delivery of an antigen or cargo molecule, such as a nucleic acid or polypeptide reagent or therapeutic drug for the purpose of research or disease treatment, comprising a combination of an alarmin peptide of any one of claims 1 to 9 with said antigen or cargo molecule.