i.e., all) of a protein not naturally found in a human, a glycan of a protein that comprises nonhuman glycosylation, a portion of a human autoimmune antigen, a portion of a human food. An embodiment is the composition wherein the erythrocyte-binding moiety is chosen from the group consisting of a peptide ligand, an antibody, an antibody fragment, and a single chain antigen binding domain (ScFv), e.g., all or a portion of 10F7. The erythrocyte-binding moiety may comprises a peptide ligand comprising at least 5 consecutive amino acid residues of a sequence chosen from the group consisting of SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:17, SEQ ID NO:1, and conservative substitutions thereof, wherein said sequence specifically binds an erythrocyte. The erythrocyte-binding moiety may be one that comprises a peptide ligand that has a dissociation constant of between about 10 μM and 0.1 nM as determined by equilibrium binding measurements between the peptide and erythrocytes. An embodiment is the case wherein the erythrocyte-binding moiety comprises an antibody, an antibody fragment or an ScFv derived from a hybridoma that produces an antibody against an erythrocyte, with the hybridoma being chosen from the group consisting of BRIC 4, BRIC 5, BRIC 6, BRIC 10, BRIC 14, BRIC 18, BRIC 39, BRIC 66, BRIC 68, BRIC 69, BRIC 87, BRIC 108, BRIC 110, BRIC 111, BRIC 125, BRIC 126, BRIC 128, BRIC 145, BRIC 155, BRIC 157, BRIC 163, BRIC 170, BRIC 198, BRIC 203, BRIC 216, BRIC 220, BRIC 221, BRIC 222, BRIC 229, BRIC 230, BRIC 231, BRIC 235, BRIC 256, BRAC 17, BRAC 18, BGRL 1, BGRL 2, BGRL 11, BGRL 100, BRAD 3, BIRMA D6, BIRMA D10, BIRMA K3, BIRMA K3, 84B; 6A7; COE; or KZ1. An embodiment is the case wherein the erythrocyte-binding moiety specifically binds to a biomolecule chosen from the group consisting of Band 3 (CD233), aquaporin-1, Glut-1, Kidd antigen, RhAg/Rh50 (CD241), Rh (CD240), Rh30CE (CD240CE), Rh30D (CD240D), Kx, glycophorin A, glycophorin B (CD235b), glycophorin C (CD235c), glycophorin D (CD235d), Kell (CD238), Duffy/DARCi (CD234), CR1 (CD35), DAF (CD55), Globoside, CD44, ICAM-4 (CD242), Lu/B-CAM (CD239), XG1/XG2 (CD99), EMMPRIN/neurothelin (CD147), JMH, Glycosyltransferase, Cartwright, Dombrock, C4A/CAB, Scianna, MER2, stomatin, BA-1 (CD24), GPIV (CD36), CD108, CD139, and H antigen (CD173). The tolerogenic antigen may comprise a mimotope.

The tolerogenic compositions may be used in treating a pathologic condition, for instance a pathologic condition chosen from the group consisting of transplant rejection, autoimmune disease, food allergy, and immune response against a therapeutic agent.

An embodiment is a pharmaceutically acceptable composition for use in immunoreversal of an immune response against a substance comprising a fusion molecule

that comprises an erythrocyte-binding moiety and an antigen of the substance. The composition may have the tolerogenic antigen is chosen from, for example, the group consisting of a protein, a portion of a protein, a human protein or portion thereof, a nonhuman protein or portion thereof, a glycan, a glycan of a protein that comprises nonhuman glycosylation, a human autoimmune antigen, a protein therapeutic for a human or a portion thereof, and a portion of a human food. The composition may have the tolerogenic antigen is chosen from, for example, the group consisting of proteins deficient by genetic disease, proteins with nonhuman glycosylation, nonhuman proteins, synthetic proteins not naturally found in humans, human food antigens, human transplantation antigens, and human autoimmune antigens. The erythrocyte-binding moiety may be provides that specifically binds to a biomolecule chosen from the group consisting of Band 3 (CD233), aquaporin-1, Glut-1, Kidd antigen, RhAg/Rh50 (CD241), Rh (CD240), Rh30CE (CD240CE), Rh30D (CD240D), Kx, glycophorin A, glycophorin B (CD235b), glycophorin C (CD235c), glycophorin D (CD235d), Kell (CD238), Duffy/DARCi (CD234), CR1 (CD35), DAF (CD55), Globoside, CD44, ICAM-4 (CD242), Lu/B-CAM (CD239), XG1/XG2 (CD99), EMMPRIN/neurothelin (CD147), JMH, Glycosyltransferase, Cartwright, Dombrock, C4A/CAB, Scianna, MER2, stomatin, BA-1 (CD24), GPIV (CD36), CD108, CD139, and H antigen (CD173). The erythrocyte-binding moiety may be chosen from the group consisting of a peptide ligand, an antibody, an antibody fragment, and a single chain antigen binding domain (ScFv). The erythrocyte-binding moiety may be prepared so that it comprises an antibody, an antibody fragment or an ScFv derived from a hybridoma that produces an antibody against an erythrocyte, with the hybridoma being chosen from the group consisting of BRIC 4, BRIC 5, BRIC 6, BRIC 10, BRIC 14, BRIC 18, BRIC 39, BRIC 66, BRIC 68, BRIC 69, BRIC 87, BRIC 108, BRIC 110, BRIC 111, BRIC 125, BRIC 126, BRIC 128, BRIC 145, BRIC 155, BRIC 157, BRIC 163, BRIC 170, BRIC 198, BRIC 203, BRIC 216, BRIC 220, BRIC 221, BRIC 222, BRIC 229, BRIC 230, BRIC 231, BRIC 235, BRIC 256, BRAC 17, BRAC 18, BGRL 1, BGRL 2, BGRL 11, BGRL 100, BRAD 3, BIRMA D6, BIRMA D10, BIRMA K3, BIRMA K3, 84B; 6A7; COE; or KZ1.

Embodiments include a fusion molecule comprising an erythrocyte-binding moiety and an antigen of asparaginase. As is evident from the multiple disclosures of erythrocyte-binding moieties, there are many options for the same, including: an scFv that binds a human erythrocyte or a peptidic binding ligand chosen from the group consisting of SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:17, and conservative substitutions thereof, wherein said sequence specifically binds an

erythrocyte. Such a composition comprising the fusion molecule may be used for inducing tolerance to asparaginase.

Embodiments include a fusion molecule comprising and an erythrocyte-binding moiety and an antigen of chromogranin-A. The antigen may be a mimotope or some or all of a chromogranin-A. As is evident from the multiple disclosures of erythrocyte-binding moieties, there are many options for the same, including: an scFv that binds a human erythrocyte or a peptidic binding ligand chosen from the group consisting of SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16, SEQ ID NO:17, and conservative substitutions thereof, wherein said sequence specifically binds an erythrocyte. Such a composition comprising the fusion molecule may be used for inducing tolerance to chromogranin-A and/or for preventing diabetes or reducing progression a diabetes disease.

Another instance is a composition comprising an erythrocyte-binding moiety that specifically binds an erythrocyte joined to an entity chosen from the group consisting of a synthetic polymer, a branched synthetic polymer, and a particle. The particle may be, e.g., a microparticle, a nanoparticle, a liposome, a polymersome, and a micelle. The composition may further comprise a tolerogenic antigen, a therapeutic agent, or a tumor homing ligand.

An embodiment is a single chain antigen binding domain (scFv) comprising a peptide ligand that specifically binds an erythrocyte. The peptide may be attached to the scFv or disposed in a linker portion. One or more of the peptide ligands may be included.

* * *

All patent applications, patents, and publications mentioned herein are hereby incorporated by reference herein for all purposes; in the case of conflict, the instant specification controls.

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<220>
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<400> 29
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<210> 30
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<220>
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<400> 30
agccggccat ggcggayatt gwgctsaccc aatc 34

<210> 31
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<220>
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<400> 31
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<210> 32
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<400> 32
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<210> 33
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<400> 34
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<210> 35
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<400> 35
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<400> 37
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<400> 38
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<210> 39
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<400> 39

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<210> 40
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<400> 46
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<400> 47
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<210> 53
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<210> 54
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<210> 55
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<210> 56
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<210> 57
<211> 51
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<400> 57
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<210> 58
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<400> 58
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<210> 59
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<400> 59
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<210> 60
<211> 51
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<220>
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<400> 60
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<210> 61
<211> 53
<212> DNA
<213> Artificial Sequence

<220>
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<400> 61
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<210> 62
<211> 51
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<210> 63
<211> 51
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<213> Artificial Sequence

<220>
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<400> 63
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<210> 64
<211> 51
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<220>
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<400> 64
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<210> 65
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<213> Artificial Sequence

<220>
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<400> 65
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<210> 66
<211> 35
<212> DNA
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<400> 66
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<210> 67
<211> 35

<212> DNA
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<220>
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<400> 67
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<210> 68
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<400> 68
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<210> 69
<211> 747
<212> DNA
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<220>
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<400> 69
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tcctgtgtag cctcaggatt cactttcagg gaccactgga tgaattgggt ccggcaggct 120

cccggaaaga ccatggagtg gattggagat attagacctg atggcagtga cacaaactat 180

gcaccatctg tgaggaatag attcacaatc tccagagaca atgccaggag catcctgtac 240

ctgcagatga gcaatatgag atctgattac acagccactt attactgtgt tagagactca 300

cctacccggg ctgggcttat ggatgcctgg ggtcaaggaa cctcagtcac tgtctcctca 360

gccggtggtg gtggttctgg tggtggtggt tctggcggcg gcggctccgg tggtggtgga 420

tccgacattc agatgacgca gtctccttca gtcctgtctg catctgtggg agacagagtc 480

actctcaact gcaaagcaag tcagaatatt aacaagtact taaactggta tcagcaaaag 540

cttggagaag ctcccaaagt cctgatatat aatacaaaca atttgcaaac gggcatccca 600

tcaaggttca gtggcagtgg atctggtaca gatttcacac tcaccatcag tagcctgcag 660

cctgaagatt ttgccacata tttctgcttt cagcattata cttggcccac gtttggaggt 720

gggaccaagc tggaaatcaa acgtact 747

<210> 70
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> PCR primer

<400> 70
actcgcggcc cagccggcca tggcggaggt gaagctgcag gagtc 45

<210> 71
<211> 65
<212> DNA
<213> Artificial Sequence

<220>
<223> PCR primer

<400> 71
ggagccgccg ccgccagaac caccaccacc agaaccacca ccaccggctg aggagacagt 60

gactg 65

<210> 72
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> PCR primer

<400> 72
ggcggcggcg gctccggtgg tggtggatcc gacattcaga tgacgcagtc 50

<210> 73
<211> 41
<212> DNA
<213> Artificial Sequence

<220>
<223> PCR primer

<400> 73
gactactagg cccccgaggc cagtacgttt gatttccagc t 41

<210> 74
<211> 793
<212> DNA
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<220>
<223> 10F7 scFv

<400> 74
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ggaactggtg aaaccgggcg cgagcgtgaa actgagctgc aaagcgagcg gctatacctt 120

taacagctat tttatgcatt ggatgaaaca gcgcccggtg cagggcctgg aatggattgg 180

catgattcgc ccgaacggcg gcaccaccga ttataacgaa aaatttaaaa acaaagcgac 240

cctgaccgtg gataaaagca gcaacaccgc gtatatgcag ctgaacagcc tgaccagcgg 300

cgatagcgcg gtgtattatt gcgcgcgctg ggaaggcagc tattatgcgc tggattattg 360

gggccagggc accaccgtga ccgtgagcag cggcggcggc ggcagcggcg gcggcggcag 420

cggcggcggc ggcagcgata ttgaactgac ccagagcccg gcgattatga gcgcgaccct 480

gggcgaaaaa gtgaccatga cctgccgcgc gagcagcaac gtgaaatata tgtattggta 540

tcagcagaaa agcggcgcga gcccgaaact gtggatttat ataccagca acctggcgag 600

cggcgtgccg ggccgcttta gcggcagcgg cagcggcacc agctatagcc tgaccattag 660

cagcgtggaa gcggaagatg cggcgaccta ttattgccag cagtttacca gcagcccgta 720

tacctttggc ggcggcacca aactggaaat taaacgcgcg gcggcggcct cgggggccga 780

gggcggcggt tct 793

<210> 75
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> epitope

<400> 75

Ser Gly Leu Glu Gln Leu Glu Ser Ile Ile Asn Phe Glu Lys Leu
1 5 10 15

<210> 76
<211> 819
<212> DNA
<213> Artificial Sequence

<220>
<223> fusion protein

<400> 76
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tcctgtgtag cctcaggatt cactttcagg gaccactgga tgaattgggt ccggcaggct 120

cccggaaaga ccatggagtg gattggagat attagacctg atggcagtga cacaaactat 180

gcaccatctg tgaggaatag attcacaatc tccagagaca atgccaggag catcctgtac 240

ctgcagatga gcaatatgag atctgattac acagccactt attactgtgt tagagactca 300

cctacccggg ctgggcttat ggatgcctgg ggtcaaggaa cctcagtcac tgtctcctca 360

gccggtggtg gtggttctgg tggtggtggt tctggcggcg gcggctccgg tggtggtgga 420

tccgacattc agatgacgca gtctccttca gtcctgtctg catctgtggg agacagagtc 480

actctcaact gcaaagcaag tcagaatatt aacaagtact taaactggta tcagcaaaag 540

cttggagaag ctcccaaagt cctgatatat aatacaaaca atttgcaaac gggcatccca 600

tcaaggttca gtggcagtgg atctggtaca gatttcacac tcaccatcag tagcctgcag 660

cctgaagatt ttgccacata tttctgcttt cagcattata cttggcccac gtttggaggt 720

gggaccaagc tggaaatcaa acgtactcat catcaccatc atcacggtgg cggttctggc 780

ctggagcagc tggagtctat tattaatttc gaaaaactg 819

<210> 77
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<212> PRT
<213> Artificial Sequence

<220>
<223> antibody portion

<400> 77

Tyr Val Arg Pro Leu Trp Val Arg Met Glu
1 5 10

<210> 78
<211> 804
<212> DNA
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<220>
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cccggaaaga ccatggagtg gattggggat attagacctg atggcagtga cacaaactat 180

gcaccatctg tgaggaatag attcacaatc tccagagaca ataccaggag catcctgtac 240

ctgcagatgg gcaatatgag atctgattac acagccactt attactgtgt tagagactca 300

cctacccggg ctgggcttat ggatgcctgg ggtcaaggaa cctcagtcac tgtctcctca 360

gccggtggtg gtggttctgg tggtggtggt tctggcggcg gcggctccgg tggtggtgga 420

tccgacattc agatgacgca gtctccttca gtcctgtctg catctgtggg agacagagtc 480

actctcaact gcaaagcaag tcagaatatt aacaagtact taaaccggta tcagcaaaag 540

cttggagaag ctcccaaagt cctggtatat aatacaaaca atttgcaaac gggcatccca 600

tcaaggttca gtggcagtgg atctggcaca gatttcacac tcaccatcag tagcctgcag 660

cctgaagatt ttgccacata tttctgcttt cagcattata cttggcccac gtttggaggt 720

gtgaccaagc tggaaatcaa acgtactcat catcaccatc atcacggtgg cggttatgtc 780

agacctctgt gggtcagaat ggaa 804

<210> 79
<211> 1026
<212> DNA
<213> Artificial Sequence

<220>
<223> fusion protein

<400> 79
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tcctgtgtag cctcaggatt cactttcagg gaccactgga tgaattgggt ccggcaggct 120

cccggaaaga ccatggagtg gattggagat attagacctg atggcagtga cacaaactat 180

gcaccatctg tgaggaatag attcacaatc tccagagaca atgccaggag catcctgtac 240

ctgcagatga gcaatatgag atctgattac acagccactt attactgtgt tagagactca 300

cctacccggg ctgggcttat ggatgcctgg ggtcaaggaa cctcagtcac tgtctcctca 360

gccggtggtg gtggttctgg tggtggtggt tctggcggcg gcggctccgg tggtggtgga 420

tccgacattc agatgacgca gtctccttca gtcctgtctg catctgtggg agacagagtc 480

actctcaact gcaaagcaag tcagaatatt aacaagtact taaactggta tcagcaaaag 540

cttggagaag ctcccaaagt cctgatatat aatacaaaca atttgcaaac gggcatccca 600

tcaaggttca gtggcagtgg atctggtaca gatttcacac tcaccatcag tagcctgcag 660

cctgaagatt ttgccacata tttctgctct cagcattata cttggcccac gtttgatggt 720

gggaccaagc tggaaatcaa acgtactcat catcaccatc atcacggtgg cggttttgtg 780

aaacagcatc tgtgcggtcc gcatctggtg gaagcgctgt atctggtgtg cggcgaacgt 840

ggctttttt ataccccgaa aagccgtcgt gaagtggaag atccgcaggt ggaacagctg 900

gaactgggcg gcagcccggg tgatctgcag accctggccc tggaagtggc gcgtcagaaa 960

cgtggcattg tggatcagtg ctgcaccagc atttgcagcc tgtatcagct ggaaaactat 1020

tacaac 1026

<210> 80
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
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<400> 80

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1 5 10 15

Arg

<210> 81
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
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<400> 81
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<210> 82
<211> 34
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<213> Artificial Sequence

<220>
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<400> 82
agccggccat ggcggayatt gttctcwccc agtc 34

<210> 83
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<220>
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<400> 83
agccggccat ggcggayatt gtgmtmactc agtc 34

<210> 84
<211> 34
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<220>
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<400> 84
agccggccat ggcggayatt gtgytracac agtc 34

<210> 85
<211> 34
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<220>
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<400> 85
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<210> 86
<211> 34

<212> DNA
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<400> 86
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<210> 87
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<400> 87
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<210> 88
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<210> 89
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<210> 90

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<400> 90
agccggccat ggcggayatt gwgctsaccc aatc 34

<210> 91
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<400> 91
agccggccat ggcggayatt stratgaccc artc 34

<210> 92
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<400> 92
agccggccat ggcggayrtt ktgatgaccc arac 34

<210> 93
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<400> 93
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<210> 94
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<400> 94
agccggccat ggcggayatt gtgataacyc agga 34

<210> 95
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<400> 95
agccggccat ggcggayatt gtgatgaccc agwt 34

<210> 96
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<400> 97
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<400> 99
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<210> 100
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<210> 103
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<400> 103
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<210> 104
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<400> 104
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<400> 105

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<400> 107
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<400> 108
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<400> 109
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CLAIMS

1. A pharmaceutically acceptable composition comprising:

a molecular fusion that comprises a tolerogenic antigen and an erythiOcyte-binding moiety that specifically binds an erythrocyte in the patient,

wherein the erythrocyte-binding moiety specifically binds to a biomolecule chosen from the group consisting of Band 3 (CD233), aquaporin-1, Glut-1 , Kidd antigen, RhAg/Rli50 (CD241), Rli (CD240), Rh30CE (CD240CE), Rh30D (CD240D), Kx, glycophorin B (CD235b), glycophorin C (CD235c), glycophorin D (CD235d), Kell (CD238), Duffy/DARCi (CD234), CR1 (CD35), DAF (CD55), Globoside, CD44, ICAM-4 (CD242), Lu/B-CAM (CD239), XG1/XG2 (CD99), EMMPRIN/neurothelin (CD147), JMH, Glycosyltransferase, Cartwright, Dombrock, C4A/CAB, Scianna, MER2, stomatin, BA-1 (CD24), GPIV (CD36), CD108, CD139, and H antigen (CD173).

2. The composition of claim 1 wherein the erythrocyte-binding moiety is covalently bonded to the antigen.

3. The composition of claim 1 or 2 wherein the erythrocyte-binding moiety is chosen from the group consisting of a peptide ligand, an antibody, an antibody fragment, and a single chain antigen binding domain (ScFv).

4. The composition of any of claims 1-3 wherein the erythrocyte-binding moiety comprises an antibody, an antibody fragment or an ScFv derived from a hybridoma that produces an antibody against an erythrocyte, with the hybridoma being chosen from the group consisting of BRIC 4, BRIC 5, BRIC 6, BRIC 10, BRIC 14, BRIC 18, BRIC 39, BRIC 66, BRIC 68, BRIC 69, BRIC 87, BRIC 108, BRIC 110, BRIC 11 1, BRIC 125, BRIC 126, BRIC 128, BRIC 145, BRIC 155, BRIC 157, BRIC 163, BRIC 170, BRIC 198, BRIC 203, BRIC 216, BRIC 220, BRIC 221, BRIC 222, BRIC 229, BRIC 230, BRIC 231, BRIC 235, BRIC 256, BRAC 17, BRAC 18, BGRL 1, BGRL 2, BGRL 11, BGRL 100, BRAD 3, BIRMA D6, BIRMA D10, BIRMA K3, BIRMA K3, BIRMA 84B; 6A7; COE; and KZ1.

5. The composition of any of claims 1-4 wherein the tolerogenic antigen compr mimotope of a protein.

6. The composition of any of claims 1 -5 wherein the tolerogenic antigen is chosen from the group consisting of a protein, a portion of a protein, a human protein or portion thereof, a nonhuman protein or portion thereof, a glycan, a glycan of a protein that comprises nonhuman glycosylation, a human autoimmune antigen, a protein therapeutic for a human or a portion thereof, and a portion of a human food.

7. The composition of any of claims 1-5 wherein the tolerogenic antigen is chosen from the group consisting of proteins deficient by genetic disease, proteins with nonhuman glycosylation, nonhuman proteins, synthetic proteins not naturally found in humans, human food antigens, human transplantation antigens, and human autoimmune antigens.

8. The composition of any of claims 1-5 wherein the tolerogenic antigen comprises an antigen chosen from the group consisting of factor VIII, factor IX. adenosine deaminase, L-asparaginase, rasburicase, antithymocyte globulin, L-arginase, L-methionase, preproinsulin, proinsulin, insulin, GAD65, GAD67, IA-2, IA-2β, thyroglobulin, thyroid peroxidase, thyrotropin receptor, myelin basic protein, myelin oligodendrocyte glycoprotein, proteolipid protein, collagen II, collagen IV, acetylcholine receptor, matrix metalloprotein 1 and 3, molecular chaperone heat-shock protein 47, fibrillin- 1, PDGF receptor a, PDGF receptor β, nuclear protein SS-A, conarachin (Ara h 1), allergen II (Ara h 2), arachis agglutinin (Ara h 6), a-lactalbumin (ALA), lactotransferrin, glutein, low molecular weight glutein, a-gliadin , γ-gliadin, hordein, secalin, and avenin.

9. The composition of claim 8 wherein the antigen is a mimotope.

10. The composition of any of claims 1-9 for use in treating a pathologic condition chosen from the group consisting of transplant rejection, autoimmune disease, food allergy, and immune response against a therapeutic agent.

11. A molecular fusion that comprises a tolerogenic antigen and an erythrocyte-binding moiety selected from Band 3 (CD233), glycophorin B (CD235b), glycophorin C (CD235c) and glycophorin D (CD235d).

12. A molecular fusion according to claim 11 for use in producing immunotolerance.

13. A molecular fusion that comprises a tolerogenic antigen selected from: a protein, a portion of a protein, a human protein or portion thereof, a nonhuman protein or portion thereof, a glycan, a glycan of a protein that comprises nonhuman glycosylation, a human autoimmune antigen, a protein therapeutic for a human or a portion thereof, and a portion of a human food, proteins deficient by genetic disease, proteins with nonhuman glycosylation, nonhuman proteins, synthetic proteins not naturally found in humans, human food antigens, human transplantation antigens, and human autoimmune antigens; and an erythrocyte-binding moiety selected from Band 3 (CD233), glycophorin B (CD235b), glycophorin C (CD235c), glycophorin D (CD235d).

14. A method of producing immunotolerance, the method comprising administering a composition comprising a molecular fusion that comprises a tolerogenic antigen and an erythrocyte-binding moiety that specifically binds an erythrocyte in the patient, wherein the molecular fusion is administered in an amount effective to produce immunotolerance to a substance that comprises the tolerogenic antigen.

15. A pharmaceutically acceptable composition for use in immunoreversal of an immune response against a substance comprising a fusion molecule that comprises an erythrocyte-binding moiety and an antigen of the substance.

16. The composition of claim 15 wherein the tolerogenic antigen is chosen from the group consisting of a protein, a portion of a protein, a human protein or portion thereof, a nonluiman protein or portion thereof, a glycan, a glycan of a protein that comprises nonhuman glycosylation, a human autoimmune antigen, a protein therapeutic for a human or a portion thereof, and a portion of a human food.

17. The composition of claim 15 wherein the tolerogenic antigen is chosen from the group consisting of proteins deficient by genetic disease, proteins with nonluiman glycosylation, nonhuman proteins, synthetic proteins not naturally found in humans, human food antigens, human

transplantation antigens, and human autoimmune antigens.

18. The composition of any of claims 15-17 wherein the erythrocyte-binding moiety specifically binds to a biomolecule chosen from the group consisting of Band 3 (CD233), aquaporin-1, Glut-1, Kidd antigen, RhAg/Rh50 (CD241), Rh (CD240), Rh30CE (CD240CE), Rh30D (CD240D), Kx, glycophorin A, glycophorin B (CD235b), glycophorin C (CD235c), glycophorin D (CD235d), Kell (CD238), Duffy/DARCi (CD234), CR1 (CD35), DAF (CD55), Globoside, CD44, ICAM-4 (CD242), Lu/B-CAM (CD239), XG1/XG2 (CD99), EMMPRIN/neurothelin (CD 147), JMH, Glycosyltransferase, Cartwiight, Dombrock, C4 A/CAB, Scianna, MER2, stomatin, BA-1 (CD24), GPIV (CD36), CD108, CD139, and H antigen (CD 173).

19. The composition of any of claims 15-17 wherein the erythrocyte-binding moiety is chosen from the group consisting of a peptide ligand, an antibody, an antibody fragment, and a single chain antigen binding domain (ScFv).

20. The composition of any of claims 15-17 wherein the erythiOcyte-binding moiety comprises an antibody, an antibody fragment or an ScFv derived from a hybridoma that produces an antibody against an erythrocyte, with the hybridoma being chosen from the group consisting of BRIC 4, BRIC 5, BRIC 6, BRIC 10, BRIC 14, BRIC 18, BRIC 39, BRIC 66, BRIC 68, BRIC 69, BRIC 87, BRIC 108, BRIC 110, BRIC 111, BRIC 125, BRIC 126, BRIC 128, BRIC 145, BRIC 155, BRIC 157, BRIC 163, BRIC 170, BRIC 198, BRIC 203, BRIC 216, BRIC 220, BRIC 221, BRIC 222, BRIC 229, BRIC 230, BRIC 231, BRIC 235, BRIC 256, BRAC 17, BRAC 18, BGRL 1, BGRL 2, BGRL 1 1 , BGRL 100, BRAD 3, BIRMA D6, BIRMA D10, BIRMA K3, BIRMA K3, BIRMA 84B; 6A7; COE; and KZ1.

21. The composition of any of claims 15-20 wherein the tolerogenic antigen comprises a mimotope of a protein.

22. A fusion molecule comprising an erythrocyte-binding moiety and an antigen of asparaginase.

23. The fusion molecule of claim 22 wherein the erythrocyte-binding moiety comprises an scFv that binds a human erythrocyte or a peptidic binding ligand chosen from the group consisting of SEQ ID NO: 1 1, SEQ ID NO: 12, SEQ ID NO: 13, SEQ ID NO: 14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, and conservative substitutions thereof, wherein said sequence specifically binds an erythrocyte.

24. A composition comprising the fusion molecule of claim 22 or 23 used for inducing tolerance to asparaginase.

25. A fusion molecule comprising an erythrocyte-binding moiety and an antigen of chromogranin-A

26. The fusion molecule of claim 25 wherein the erythrocyte-binding moiety comprises an scFv that binds a human erythrocyte or a peptidic binding ligand chosen from the group consisting of SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, and conservative substitutions thereof, wherein said sequence specifically binds an erythrocyte.

27. A composition comprising the fusion molecule of claim 25 or 26 used for inducing tolerance to chromogranin-A.

28. A pharmaceutically acceptable composition comprising:

an erythrocyte-binding moiety joined to a domain that specifically binds a target.

29. The composition of claim 28 wherein the target comprises a protein, with the protein further comprising a tolerogenic antigen.

30. The composition of claim 28 or 29 wherein the erythrocyte-binding moiety comprises a peptide ligand,

31. The composition of claim 28 or 29 wherein the erythrocyte-binding moiety is chosen from

the group consisting of an antibody, an antibody fragment, and a single chain antigen binding domain (ScFv).

32. The composition of any of claims 28-31 wherein the domain is chosen from the group consisting of an antibody, an antibody fragment, and a single chain antigen binding domain (ScFv).

33. The composition of any of claim s 28-32 wherein the composition comprises a member of the group chosen from a molecular fusion, a tandem scFv, a diabody, and a tandem scFv-IgG molecule, with the erythrocyte-binding moiety and the domain being part of said member.

34. A pharmaceutically acceptable composition comprising:
an erythrocyte-binding moiety joined to an antigen.

35. The composition of claim 34 wherein the antigen is a native auto-antigen.

36. The composition of claim 34 or 35 wherein the auto-antigen is chosen from the group consisting of a lupus erythematosis antigens.

37. The composition of any of claims 34-36 wherein the antigen is for a therapeutic protein.

38. The composition of claim 37 wherein the antigen is a Factor VIII antigen.

39. A use of the composition of any of claims 34-37 for removing undesired antibodies from circulation.