Claims

1. A compound comprising a biopolymer scaffold and at least two peptides with a sequence length of 6-13 amino acids, wherein the compound is non-immunogenic in humans,

wherein each of the peptides independently comprises a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, even more preferably a 9-, even more preferably a 10-, even more preferably an 11-, yet even more preferably a 12-, most preferably a 13-amino-acid fragment, of an amino-acid sequence of a neuroreceptor, identified by a UniProt accession code selected from the group consisting of:

P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77, B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399, O43424, O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916, O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026, P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58, P12931, P13500, P14416, P14867, P15382, P16066, P17342, P18505, P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415, P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223, P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411, P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367, P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597, P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898, P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354, P50052, P50406, P53355, P55000, P62955, P63252, P78334, P78352, P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002, Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972, Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832, Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553, Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9, Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67, Q8NFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3, Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1,

Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91, Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3, Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02, Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691, Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, P48664, A6NGN9, O00305, O00555, O15146, O43448, O43497, O43525, O43526, O60840, O75096, O95180, O95259, O95970, P06213, P16389, P16473, P17658, P22001, P22459, P22460, P24530, P42658, P43146, P48547, P49418, P51787, P54284, P54289, P56696, Q00975, Q01668, Q02246, Q02641, Q03721, Q05329, Q06432, Q08289, Q09470, Q12809, Q13018, Q13303, Q13698, Q14003, Q14721, Q14722, Q15878, Q6PIL6, Q6PIU1, Q6X4W1, Q7Z3S7, Q7Z429, Q8IZS8, Q8NCM2, Q8TAE7, Q8TDN1, Q8TDN2, Q8WWG9, Q92953, Q96KK3, Q96L42, Q96PR1, Q96RP8, Q9BQ31, Q9BXT2, Q9H252, Q9H3M0, Q9NR82, Q9NS40, Q9NS61, Q9NSA2, Q9NY47, Q9NZI2, Q9NZV8, Q9P0X4, Q9UHC6, Q9UIX4, Q9UJ90, Q9UJ96, Q9UK17, Q9ULD8, Q9ULS6, Q9UQ05, Q9Y2W7, Q9Y6H6, Q9Y6J6, P48058, P55087, Q9BPU6, P52799, P15328, Q05329, Q16653, Q9Y4C0, Q5F0I5, Q99719, P17600, Q13148, P01266, P07202, and Q9Y6A1,

optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

2. The compound of claim 1, wherein said amino-acid sequence is an amino acid sequence of a neuroreceptor of the autonomic nervous system, identified by a UniProt accession code selected from the group consisting of: P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1; P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, and P48664.

3. The compound of claim 1 or 2, wherein said amino acid sequence is an amino acid sequence of a neuroreceptor selected from the group consisting of muscarinic, and nicotinic

cholinergic receptors, alpha- and beta- adrenergic receptors, serotonin receptors, angiotensin- and endothelin receptors.

4. The compound of any one of claims 1 to 3, wherein said amino-acid sequence is an amino acid sequence of a neuroreceptor selected from the group consisting of beta-1 adrenergic receptor, beta-2 adrenergic receptor, M3 muscarinic acetylcholine receptor, and M4 muscarinic acetylcholine receptor, identified by a UniProt accession code selected from the group consisting of: P08588, P07550, P20309, and P08173.

5. The compound of any one of claims 1 to 4, wherein, for at least one of the peptides, said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536, preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

6. The compound of any one of claims 1 to 5, wherein the at least two peptides comprise a peptide P_1 and a peptide P_2, wherein P_1 and P_2 independently comprise a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, more preferably a 9-, even more preferably a 10-, yet even more preferably an 11-, especially a 12-, most preferably a 13-amino-acid fragment, of an amino acid sequence as defined in any one of claims 1 to 4, wherein P_1 and P_2 are present in form of a peptide dimer **$P_1 - S - P_2$**, wherein S is a non-peptide spacer, wherein the peptide dimer is covalently bound to the biopolymer scaffold, preferably via a linker;

preferably wherein, for peptide P_1 and/or peptide P_2, said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least

10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536, preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

7. The compound of any one of claims 1 to 6, wherein the biopolymer scaffold is selected from human globulins and human albumin.

8. The compound of any one of claims 1 to 7, wherein at least one of the at least two peptides, preferably each of the at least two peptides, is circularized.

~~9. The compound of any one of claims 1 to 8, wherein the compound is non-immunogenic in humans.~~

~~10~~9. The compound of any one of claims 1 to 8~~9~~, wherein the biopolymer scaffold is human transferrin.

~~11~~10. A pharmaceutical composition comprising the compound of any one of claims 1 to ~~10~~ 9 and at least one pharmaceutically acceptable excipient.

~~12~~11. The pharmaceutical composition of claim ~~11~~10, wherein the molar ratio of the peptides to scaffold in the composition is from 2:1 to 100:1, preferably from 3:1 to 90:1, more preferably from 4:1 to 80:1, even more preferably from 5:1 to 70:1, yet even more preferably from 6:1 to 60:1, especially from 7:1 to 50:1 or even from 8:10 to 40:1.

~~13~~12. The pharmaceutical composition of claim ~~11~~ 10 or ~~12~~11, for use in prevention or treatment of an autoantibody-mediated condition, preferably selected from Myalgic

Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS), postural orthostatic tachycardia syndrome (POTS), Autoimmune Autonomic Ganglionopathy (AAG), Idiopathic Dilated Cardiomyopathy (IDC), Chronic Chagas heart disease (cChHD), encephalitis such as limbic encephalitis or paraneoplastic striatal encephalitis or Anti-mGluR1 encephalitis or Anti-mGluR5 encephalitis or acute disseminated encephalomyelitis (ADEM) or NMDAR encephalitis, paraneoplastic syndrome, stiff man syndrome, autoimmune channelopathies, neuromyelitis optica, neuromyotonia, Morvan's syndrome, neuropathic pain, myelitis, optic neuritis, retinitis, parkinsonism, chorea, psychosis, dystonia, mutism, movement disorders, confusion, hallucinations, prodromal diarrhoea, memory loss, hyperexcitability, encephalitis psychiatric syndrome, narcolepsy, autism spectrum disorders, seizures, status epilepticus, chronic epilepsy, myoclonus, encephalomyelitis, myoclonus, parasomnia, sleep apnoea, cognitive impairment, gait abnormalities, faciobrachial dystonic seizures, paraneoplastic syndrome, cerebellar ataxia, dysautonomia, Tourette, ADHD, cerebellar ataxia, oscillopsia, amyotrophic lateral sclerosis (ALS), thyroid disorder and headache with neurological deficits and lymphocytosis (HaNDL), in an individual.

~~14~~13. The pharmaceutical composition for use according to claim ~~13~~12, wherein the composition is administered at a dose of 1-1000 mg, preferably 2-500 mg, more preferably 3-250 mg, even more preferably 4-100 mg, especially 5-50 mg, compound per kg body weight of the individual.

~~15~~14. The pharmaceutical composition for use according to claim ~~13~~ 12 or ~~14~~13, wherein the composition is administered intraperitoneally, subcutaneously, intramuscularly or intravenously.

~~16. A method of ameliorating or treating an autoimmune disease or autoantibody-mediated condition, preferably ME/CFS, in an individual in need thereof, comprising~~

~~obtaining a pharmaceutical composition as defined in claim 11 or 12; and~~

~~administering an effective amount of the pharmaceutical composition to the individual.~~