Claims

1. A bispecific single chain antibody construct comprising a first human binding domain which binds to an epitope cluster of human CDH3 on the surface of a target cell, wherein the first binding domain also binds to macaque CDH3, preferably to Macaca fascicularis CDH3, and comprising a second binding domain which binds to human CD3 on the surface of a T cell, wherein the epitope cluster of human CDH3 is comprised within amino acid positions 291-363 (SEQ ID NO: 36) of human CDH3 as depicted in SEQ ID NO: 1, wherein the binding domains have the following format: pairs of VH regions and VL regions in the format of an scFv, and wherein redirected lysis of target cells via the recruitment of T cells by the antibody construct involves cytolytic synapse formation and delivery of perforin and granzymes.

2. The bispecific single chain antibody construct according to claim 1, wherein the first binding domain binds to an epitope which is comprised within amino acid positions 291-327 (SEQ ID NO: 34) of human CDH3 as depicted in SEQ ID NO: 1.

3. The bispecific single chain antibody construct according to claim 1, wherein the first binding domain binds to an epitope which is comprised within amino acid positions 328-363 (SEQ ID NO: 35) of human CDH3.

4. ~~The antibody construct according to claim 3~~ as depicted in SEQ ID NO: 1, wherein the first binding domain preferably also binds to an epitope which is comprised within amino acid positions 404-440 (SEQ ID NO: 390) of human CDH3 as depicted in SEQ ID NO: 1.

5~~4~~. The ~~antibody construct according to any one of the preceding claims, wherein the first binding domain also binds to macaque CDH3, preferably to Macaca fascicularis CDH3.~~

6. ~~The~~bispecific single chain antibody construct according to any one of claims 1~~, 2~~ and 5~~2~~, wherein the first binding domain comprises a VH region comprising CDR-H1, CDR-H2 and CDR-H3 and a VL region comprising CDR-L1, CDR-L2 and CDR-L3 selected from the group consisting of:

a) CDR-H1 as depicted in SEQ ID NO: 149, CDR-H2 as depicted in SEQ ID NO: 150, CDR-H3 as depicted in SEQ ID NO: 151, CDR-L1 as depicted in SEQ ID

NO: 152, CDR-L2 as depicted in SEQ ID NO: 153 and CDR-L3 as depicted in SEQ ID NO: 154;

b) CDR-H1 as depicted in SEQ ID NO: 159, CDR-H2 as depicted in SEQ ID NO: 160, CDR-H3 as depicted in SEQ ID NO: 161, CDR-L1 as depicted in SEQ ID NO: 162, CDR-L2 as depicted in SEQ ID NO: 163 and CDR-L3 as depicted in SEQ ID NO: 164;

c) CDR-H1 as depicted in SEQ ID NO: 169, CDR-H2 as depicted in SEQ ID NO: 170, CDR-H3 as depicted in SEQ ID NO: 171, CDR-L1 as depicted in SEQ ID NO: 172, CDR-L2 as depicted in SEQ ID NO: 173 and CDR-L3 as depicted in SEQ ID NO: 174;

d) CDR-H1 as depicted in SEQ ID NO: 179, CDR-H2 as depicted in SEQ ID NO: 180, CDR-H3 as depicted in SEQ ID NO: 181, CDR-L1 as depicted in SEQ ID NO: 182, CDR-L2 as depicted in SEQ ID NO: 183 and CDR-L3 as depicted in SEQ ID NO: 184;

e) CDR-H1 as depicted in SEQ ID NO: 189, CDR-H2 as depicted in SEQ ID NO: 190, CDR-H3 as depicted in SEQ ID NO: 191, CDR-L1 as depicted in SEQ ID NO: 192, CDR-L2 as depicted in SEQ ID NO: 193 and CDR-L3 as depicted in SEQ ID NO: 194;

f) CDR-H1 as depicted in SEQ ID NO: 199, CDR-H2 as depicted in SEQ ID NO: 200, CDR-H3 as depicted in SEQ ID NO: 201, CDR-L1 as depicted in SEQ ID NO: 202, CDR-L2 as depicted in SEQ ID NO: 203 and CDR-L3 as depicted in SEQ ID NO: 204;

g) CDR-H1 as depicted in SEQ ID NO: 209, CDR-H2 as depicted in SEQ ID NO: 210, CDR-H3 as depicted in SEQ ID NO: 211, CDR-L1 as depicted in SEQ ID NO: 212, CDR-L2 as depicted in SEQ ID NO: 213 and CDR-L3 as depicted in SEQ ID NO: 214;

h) CDR-H1 as depicted in SEQ ID NO: 219, CDR-H2 as depicted in SEQ ID NO: 220, CDR-H3 as depicted in SEQ ID NO: 221, CDR-L1 as depicted in SEQ ID NO: 222, CDR-L2 as depicted in SEQ ID NO: 223 and CDR-L3 as depicted in SEQ ID NO: 224;

i) CDR-H1 as depicted in SEQ ID NO: 229, CDR-H2 as depicted in SEQ ID NO: 230, CDR-H3 as depicted in SEQ ID NO: 231, CDR-L1 as depicted in SEQ ID NO: 232, CDR-L2 as depicted in SEQ ID NO: 233 and CDR-L3 as depicted in SEQ ID NO: 234; and

j) CDR-H1 as depicted in SEQ ID NO: 239, CDR-H2 as depicted in SEQ ID NO: 240, CDR-H3 as depicted in SEQ ID NO: 241, CDR-L1 as depicted in SEQ ID

NO: 242, CDR-L2 as depicted in SEQ ID NO: 243 and CDR-L3 as depicted in SEQ ID NO: 244.

~~7~~5. The bispecific single chain antibody construct according to any one of claims 1~~, 3, 4~~ and ~~5~~3, wherein the first binding domain comprises a VH region comprising CDR-H1, CDR-H2 and CDR-H3 and a VL region comprising CDR-L1, CDR-L2 and CDR-L3 selected from the group consisting of:

a) CDR-H1 as depicted in SEQ ID NO: 279, CDR-H2 as depicted in SEQ ID NO: 280, CDR-H3 as depicted in SEQ ID NO: 281, CDR-L1 as depicted in SEQ ID NO: 282, CDR-L2 as depicted in SEQ ID NO: 283 and CDR-L3 as depicted in SEQ ID NO: 284;

b) CDR-H1 as depicted in SEQ ID NO: 289, CDR-H2 as depicted in SEQ ID NO: 290, CDR-H3 as depicted in SEQ ID NO: 291, CDR-L1 as depicted in SEQ ID NO: 292, CDR-L2 as depicted in SEQ ID NO: 293 and CDR-L3 as depicted in SEQ ID NO: 294;

c) CDR-H1 as depicted in SEQ ID NO: 299, CDR-H2 as depicted in SEQ ID NO: 300, CDR-H3 as depicted in SEQ ID NO: 301, CDR-L1 as depicted in SEQ ID NO: 302, CDR-L2 as depicted in SEQ ID NO: 303 and CDR-L3 as depicted in SEQ ID NO: 304;

d) CDR-H1 as depicted in SEQ ID NO: 309, CDR-H2 as depicted in SEQ ID NO: 310, CDR-H3 as depicted in SEQ ID NO: 311, CDR-L1 as depicted in SEQ ID NO: 312, CDR-L2 as depicted in SEQ ID NO: 313 and CDR-L3 as depicted in SEQ ID NO: 314;

e) CDR-H1 as depicted in SEQ ID NO: 319, CDR-H2 as depicted in SEQ ID NO: 320, CDR-H3 as depicted in SEQ ID NO: 321, CDR-L1 as depicted in SEQ ID NO: 322, CDR-L2 as depicted in SEQ ID NO: 323 and CDR-L3 as depicted in SEQ ID NO: 324;

f) CDR-H1 as depicted in SEQ ID NO: 329, CDR-H2 as depicted in SEQ ID NO: 330, CDR-H3 as depicted in SEQ ID NO: 331, CDR-L1 as depicted in SEQ ID NO: 332, CDR-L2 as depicted in SEQ ID NO: 333 and CDR-L3 as depicted in SEQ ID NO: 334;

g) CDR-H1 as depicted in SEQ ID NO: 339, CDR-H2 as depicted in SEQ ID NO: 340, CDR-H3 as depicted in SEQ ID NO: 341, CDR-L1 as depicted in SEQ ID NO: 342, CDR-L2 as depicted in SEQ ID NO: 343 and CDR-L3 as depicted in SEQ ID NO: 344; and

h) CDR-H1 as depicted in SEQ ID NO: 349, CDR-H2 as depicted in SEQ ID NO: 350, CDR-H3 as depicted in SEQ ID NO: 351, CDR-L1 as depicted in SEQ ID

NO: 352, CDR-L2 as depicted in SEQ ID NO: 353 and CDR-L3 as depicted in SEQ ID NO: 354.

~~8~~6. The bispecific single chain antibody construct according to claim ~~6~~4, wherein the first binding domain comprises a VH region selected from the group consisting of VH regions as depicted in SEQ ID NO: 155, SEQ ID NO: 165, SEQ ID NO: 175, SEQ ID NO: 185, SEQ ID NO: 195, SEQ ID NO: 205, SEQ ID NO: 215, SEQ ID NO: 225, SEQ ID NO: 235, and SEQ ID NO: 245~~.~~ and/or wherein the first binding domain comprises a VL region selected from the group consisting of VL regions as depicted in SEQ ID NO: 156, SEQ ID NO: 166, SEQ ID NO: 176, SEQ ID NO: 186, SEQ ID NO: 196, SEQ ID NO: 206, SEQ ID NO: 216, SEQ ID NO: 226, SEQ ID NO: 236, and SEQ ID NO: 246.

~~9~~7. The bispecific single chain antibody construct according to claim ~~7~~5, wherein the first binding domain comprises a VH region selected from the group consisting of VH regions as depicted in SEQ ID NO: 285, SEQ ID NO: 295, SEQ ID NO: 305, SEQ ID NO: 315, SEQ ID NO: 325, SEQ ID NO: 335, SEQ ID NO: 345, and SEQ ID NO: 355, and/or wherein the first binding domain comprises a VL region selected from the group consisting of VL regions as depicted in SEQ ID NO: 286, SEQ ID NO: 296, SEQ ID NO: 306, SEQ ID NO: 316, SEQ ID NO: 326, SEQ ID NO: 336, SEQ ID NO: 346, and SEQ ID NO: 356.

~~10~~8. The ~~antibody construct according to claim 6 or 8, wherein the first binding domain comprises a VL region selected from the group consisting of VL regions as depicted in SEQ ID NO: 156, SEQ ID NO: 166, SEQ ID NO: 176, SEQ ID NO: 186, SEQ ID NO: 196, SEQ ID NO: 206, SEQ ID NO: 216, SEQ ID NO: 226, SEQ ID NO: 236, and SEQ ID NO: 246.~~

~~11. The antibody construct according to claim 7 or 9, wherein the first binding domain comprises a VL region selected from the group consisting of VL regions as depicted in SEQ ID NO: 286, SEQ ID NO: 296, SEQ ID NO: 306, SEQ ID NO: 316, SEQ ID NO: 326, SEQ ID NO: 336, SEQ ID NO: 346, and SEQ ID NO: 356.~~

~~12. The~~bispecific single chain antibody construct according to any one of claims ~~6, 8~~5 or ~~10~~6, wherein the first binding domain comprises a VH region and a VL region selected from the group consisting of pairs of a VH region and a VL region as depicted in SEQ ID NO: 155+156, SEQ ID NO: 165+166, SEQ ID NO: 175+176,

SEQ ID NO: 185+186, SEQ ID NO: 195+196, SEQ ID NO: 205+206, SEQ ID NO: 215+216, SEQ ID NO: 225+226, SEQ ID NO: 235+236, and SEQ ID NO: 245+246.

~~13~~9. The bispecific single chain antibody construct according to any one of claims ~~7, 9~~5 or ~~11~~7 or, wherein the first binding domain comprises a VH region and a VL region selected from the group consisting of pairs of a VH region and a VL region as depicted in SEQ ID NO: 285+286, SEQ ID NO: 295+296, SEQ ID NO: 305+306, SEQ ID NO: 315+316, SEQ ID NO: 325+326, SEQ ID NO: 335+336, SEQ ID NO: 345+346, and SEQ ID NO: 355+356.

~~14~~10. The bispecific single chain antibody construct according to any one of ~~the preceding~~ claims~~, wherein the antibody construct is in a format selected from the group consisting of $(scFv)_2$, scFv-single domain mAb, diabodies and oligomers of the foregoing formats.~~

~~15. The antibody construct according to any one of claims~~ 4, 6, ~~8, 10, 12~~ or ~~14~~8, wherein the first binding domain comprises an amino acid sequence selected from the group consisting of those depicted in SEQ ID NO: 157, SEQ ID NO: 167, SEQ ID NO: 177, SEQ ID NO: 187, SEQ ID NO: 197, SEQ ID NO: 207, SEQ ID NO: 217, SEQ ID NO: 227, SEQ ID NO: 237, and SEQ ID NO: 247.

~~16~~11. The bispecific single chain antibody construct according to any one of claims 5, 7, ~~9, 11, 13~~ or ~~14~~9, wherein the first binding domain comprises an amino acid sequence selected from the group consisting of those depicted in SEQ ID NO: 287, SEQ ID NO: 297, SEQ ID NO: 307, SEQ ID NO: 317, SEQ ID NO: 327, SEQ ID NO: 337, SEQ ID NO: 347, and SEQ ID NO: 357.

~~17~~12. The bispecific single chain antibody construct according to any one of the preceding claims, wherein the second binding domain binds to human and Callithrix jacchus, Saguinus Oedipus or Saimiri sciureus CD3 epsilon.

~~18~~13. The bispecific single chain antibody construct according to any one of claims 4, 6, 8, 10, ~~12, 14, 15~~ or ~~17~~12, comprising an amino acid sequence selected from the group consisting of those depicted in SEQ ID NO: 158, SEQ ID NO: 168, SEQ ID NO: 178, SEQ ID NO: 188, SEQ ID NO: 198, SEQ ID NO: 208, SEQ ID NO: 218, SEQ ID NO: 228, SEQ ID NO: 238, and SEQ ID NO: 248 or comprising an amino acid sequence selected from the group consisting of those depicted in SEQ ID NO: 379,

SEQ ID NO: 380, SEQ ID NO: 381, SEQ ID NO: 382, SEQ ID NO: 383, SEQ ID NO: 384, SEQ ID NO: 385, SEQ ID NO: 386, SEQ ID NO: 387, SEQ ID NO: 388, SEQ ID NO: 389, SEQ ID NO: 422, SEQ ID NO: 423, SEQ ID NO: 424, SEQ ID NO: 425, SEQ ID NO: 426 and SEQ ID NO: 427.

~~19~~14. The bispecific single chain antibody construct according to any one of claims 5, 7, 9, 11~~, 13, 14, 16~~ or ~~17~~12 comprising an amino acid sequence selected from the group consisting of those depicted in SEQ ID NO: 288, SEQ ID NO: 298, SEQ ID NO: 308, SEQ ID NO: 318, SEQ ID NO: 328, SEQ ID NO: 338, SEQ ID NO: 348, and SEQ ID NO: 358.

~~20. The antibody construct according to any one of claims 6, 8, 10, 12, 14, 15, 17 or 18, comprising an amino acid sequence selected from the group consisting of those depicted in SEQ ID NO: 379, SEQ ID NO: 380, SEQ ID NO: 381, SEQ ID NO: 382, SEQ ID NO: 383, SEQ ID NO: 384, SEQ ID NO: 385, SEQ ID NO: 386, SEQ ID NO: 387, SEQ ID NO: 388, SEQ ID NO: 389, SEQ ID NO: 422, SEQ ID NO: 423, SEQ ID NO: 424, SEQ ID NO: 425, SEQ ID NO: 426 and SEQ ID NO: 427.~~

~~21~~15. A polynucleotide encoding ~~an~~a bispecific single chain Fv antibody construct as defined in any one of the preceding claims.

~~22~~16. A vector comprising a polynucleotide as defined in claim ~~21~~15.

~~23~~17. A host cell transformed or transfected with the polynucleotide as defined in claim ~~21~~15 or with the vector as defined in claim ~~22~~16.

~~24~~18. A process for the production of ~~an~~the bispecific single chain antibody construct according to any one of claims 1 to ~~20~~14, said process comprising culturing a host cell as defined in claim ~~23~~17 under conditions allowing the expression of the antibody construct as defined in any one of claims 1 to ~~20~~14 and recovering the produced antibody construct from the culture.

~~25. A pharmaceutical composition comprising an antibody construct according to any one of claims 1 to 20, or produced according to the process of claim 24.~~

26. The antibody construct according to any one of claims 1 to 20, or produced according to the process of claim 24, for use in the prevention, treatment or amelioration of a tumor or a cancer.

27. The antibody construct according to claim 26, wherein the cancer is selected from the group consisting of, lung carcinoma, head and neck carcinoma, a primary or secondary CNS tumor, a primary or secondary brain tumor, primary CNS lymphoma, spinal axis tumors, brain stem glioma, pituitary adenoma, adrenocortical cancer, esophagus carcinoma, colon cancer, breast cancer, ovarian cancer, NSCLC (non-small cell lung cancer), SCLC (small cell lung cancer), endometrial cancer, cervical cancer, uterine cancer, transitional cell carcinoma, bone cancer, pancreatic cancer, skin cancer, cutaneous or intraocular melanoma, hepatic cancer, biliary duct cancer, gall bladder cancer, kidney cancer, rectal cancer, cancer of the anal region, stomach cancer, gastrointestinal (gastric, colorectal, and duodenal) cancer, cancer of the small intestine, biliary tract cancer, cancer of the urethra, renal cell carcinoma, carcinoma of the endometrium, thyroid cancer, testicular cancer, cutaneous squamous cell cancer, melanoma, stomach cancer, prostate cancer, bladder cancer, osteosarcoma, mesothelioma, Hodgkin's Disease, non hodgkins's lymphoma, chronic or acute leukemia, chronic myeloid leukemia, lymphocytic lymphomas, multiple myeloma, fibrosarcoma, neuroblastoma, retinoblastoma, and soft tissue sarcoma.

28. The antibody construct according to claim 27, wherein the cancer is a squamous cell carcinoma.

29. A method for the treatment, prevention or amelioration of a tumor or cancer, comprising the step of administering to a subject in need thereof thekit comprising a bispecific single chain antibody construct according to any one of claims 1 to 20, or 14, an antibody construct produced according to the process of claim 24.

30. The method according to claim 29, wherein the cancer is selected from the group consisting of, lung carcinoma, head and neck carcinoma, a primary or secondary CNS tumor, a primary or secondary brain tumor, primary CNS lymphoma, spinal axis tumors, brain stem glioma, pituitary adenoma, adrenocortical cancer, esophagus carcinoma, colon cancer, breast cancer, ovarian cancer, NSCLC (non-small cell lung cancer), SCLC (small cell lung cancer), endometrial cancer, cervical cancer, uterine cancer, transitional cell carcinoma, bone cancer, pancreatic cancer, skin cancer, cutaneous or intraocular melanoma, hepatic cancer, biliary duct cancer, gall bladder cancer,

~~kidney cancer, rectal cancer, cancer of the anal region, stomach cancer, gastrointestinal (gastric, colorectal, and duodenal) cancer, cancer of the small intestine, biliary tract cancer, cancer of the urethra, renal cell carcinoma, carcinoma of the endometrium, thyroid cancer, testicular cancer, cutaneous squamous cell cancer, melanoma, stomach cancer, prostate cancer, bladder cancer, osteosarcoma, mesothelioma, Hodgkin's Disease, non hodgkins's lymphoma, chronic or acute leukemia, chronic myeloid leukemia, lymphocytic lymphomas, multiple myeloma, fibrosarcoma, neuroblastoma, retinoblastoma, and soft tissue sarcoma.~~

~~31. The method according to claim 30 wherein the cancer is a squamous cell carcinoma.~~

19~~32~~. A kit comprising a~~n~~ bispecific single chain antibody construct according to any one of claims 1 to 14~~20~~, an antibody construct produced according to the process of claim ~~24~~18, a vector as defined in claim ~~22~~16, and/or a host cell as defined in claim ~~23.~~17.