

WHAT WE CLAIM IS:

1. An antibody or antigen binding fragment thereof that binds to tau-pS413, comprising:
 - (a) a heavy chain variable region complementarity determining region 1 (VH-CDR1) comprising the amino acid sequence of SEQ ID NO:41; a heavy chain variable region complementarity determining region 2 (VH-CDR2) comprising the amino acid sequence of SEQ ID NO:42; and a heavy chain variable region complementarity determining region 3 (VH-CDR3) comprising the amino acid sequence of SEQ ID NO:43; and
a light chain variable region complementarity determining region 1 (VL-CDR1) comprising the amino acid sequence of SEQ ID NO:29; a light chain variable region complementarity determining region 2 (VL-CDR2) comprising the amino acid sequence of SEQ ID NO:30; and a light chain variable region complementarity determining region 3 (VL-CDR3) comprising the amino acid sequence of SEQ ID NO:31;
(b) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:41; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:42; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:43; and
a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:33; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:34; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:35;
(c) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:41; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:42; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:43; and
a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:37; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:38; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:39;
(d) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:41; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:42; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:43; and
a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:25; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:26; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:27;
(e) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:41; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:42; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:43; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:17; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:18; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:19;

(f) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:45; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:46; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:47; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:29; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:30; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:31;

(g) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:45; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:46; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:47; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:33; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:34; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:35;

(h) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:45; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:46; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:47; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:37; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:38; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:39;

(i) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:45; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:46; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:47; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:25; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:26; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:27;

(j) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:45; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:46; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:47; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:17; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:18; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:19;

(k) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:49; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:50; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:51; and

5 a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:29; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:30; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:31;

(l) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:49; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:50; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:51; and

10 a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:33; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:34; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:35;

(m) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:49; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:50; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:51; and

15 a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:37; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:38; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:39;

(n) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:49; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:50; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:51; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:25; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:26; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:27;

25 (o) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:49; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:50; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:51; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:17; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:18; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:19;

30 (p) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:53; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:54; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:55; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:29; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:30; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:31;

(q) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:53; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:54; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:55; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:33; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:34; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:35;

(r) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:53; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:54; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:55; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:37; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:38; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:39;

(s) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:53; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:54; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:55; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:25; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:26; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:27;

(t) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:53; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:54; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:55; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:17; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:18; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:19;

(u) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:21; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:22; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:23; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:29; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:30; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:31;

(v) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:21; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:22; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:23; and

5 a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:33; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:34; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:35;

(w) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:21; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:22; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:23; and

10 a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:37; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:38; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:39;

(x) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:86; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:87; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:88; and

15 a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:83; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:84; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:85;

(y) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:92; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:93; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:94; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:89; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:90; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:91;

25 (z) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:98; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:99; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:100; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:95; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:96; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:97; or

30 (aa) a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:104; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:105; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:106; and

a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:101; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:102; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:103.

- 5 2. An antibody or antigen binding fragment thereof that binds to tau-pS413, comprising:
- (a) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a heavy chain variable region (VH) comprising the amino acid sequence of SEQ ID NO:44; and
- a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a light chain variable region (VL) comprising the amino acid sequence of SEQ ID NO:32;
- 10 (b) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:44; and
- a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:36;
- (c) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid
- 15 sequence of SEQ ID NO:44; and
- a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:40;
- (d) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:44; and
- 20 a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:28;
- (e) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:44; and
- a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence
- 25 of SEQ ID NO:20;
- (f) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:48; and
- a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:32;
- 30 (g) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:48; and
- a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:36;

- (h) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:48; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:40;
- 5 (i) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:48; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:28;
- (j) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid
10 sequence of SEQ ID NO:48; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:20;
- (k) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:52; and
15 a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:32;
- (l) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:52; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence
20 of SEQ ID NO:36;
- (m) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:52; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:40;
- 25 (n) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:52; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:28;
- (o) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid
30 sequence of SEQ ID NO:52; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:20;

- (p) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:56; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:32;
- 5 (q) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:56; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:36;
- (r) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid
10 sequence of SEQ ID NO:56; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:40;
- (s) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:56; and
15 a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:28;
- (t) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:56; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence
20 of SEQ ID NO:20;
- (u) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:24; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:32;
- 25 (v) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:24; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:36; or
- (w) a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid
30 sequence of SEQ ID NO:24; and
a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:40.

3. The antibody or antigen-binding fragment of claim 1 or 2, comprising:
- (a) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:44, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:32;
 - 5 (b) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:44, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:36;
 - (c) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:44, and a VL having at least 90% amino acid sequence identity to the amino acid
10 sequence of SEQ ID NO:40;
 - (d) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:44, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:28;
 - (e) a VH having at least 90% amino acid sequence identity to the amino acid sequence of
15 SEQ ID NO:44, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:20;
 - (f) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:48, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:32;
 - 20 (g) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:48, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:36;
 - (h) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:48, and a VL having at least 90% amino acid sequence identity to the amino acid
25 sequence of SEQ ID NO:40;
 - (i) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:48, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:28;
 - 30 (j) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:48, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:20;

(k) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:52, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:32;

5 (l) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:52, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:36;

(m) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:52, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:40;

10 (n) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:52, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:28;

(o) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:52, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:20;

(p) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:56, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:32;

20 (q) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:56, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:36;

(r) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:56, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:40;

25 (s) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:56, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:28;

(t) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:56, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:20;

30 (u) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:24, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:32;

- (v) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:24, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:36; or
- (w) a VH having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:24, and a VL having at least 90% amino acid sequence identity to the amino acid sequence of SEQ ID NO:40.
4. An antibody or antigen binding fragment thereof that binds to tau-pS413, comprising:
- (a) a VH having the amino acid sequence of SEQ ID NO:44, and a VL having the amino acid sequence of SEQ ID NO:32;
- (b) a VH having the amino acid sequence of SEQ ID NO:44, and a VL having the amino acid sequence of SEQ ID NO:36;
- (c) a VH having the amino acid sequence of SEQ ID NO:44, and a VL having the amino acid sequence of SEQ ID NO:40;
- (d) a VH having the amino acid sequence of SEQ ID NO:44, and a VL having the amino acid sequence of SEQ ID NO:28;
- (e) a VH having the amino acid sequence of SEQ ID NO:44, and a VL having the amino acid sequence of SEQ ID NO:20;
- (f) a VH having the amino acid sequence of SEQ ID NO:48, and a VL having the amino acid sequence of SEQ ID NO:32;
- (g) a VH having the amino acid sequence of SEQ ID NO:48, and a VL having the amino acid sequence of SEQ ID NO:36;
- (h) a VH having the amino acid sequence of SEQ ID NO:48, and a VL having the amino acid sequence of SEQ ID NO:40;
- (i) a VH having the amino acid sequence of SEQ ID NO:48, and a VL having the amino acid sequence of SEQ ID NO:28;
- (j) a VH having the amino acid sequence of SEQ ID NO:48, and a VL having the amino acid sequence of SEQ ID NO:20;
- (k) a VH having the amino acid sequence of SEQ ID NO:52, and a VL having the amino acid sequence of SEQ ID NO:32;
- (l) a VH having the amino acid sequence of SEQ ID NO:52, and a VL having the amino acid sequence of SEQ ID NO:36;

- (m) a VH having the amino acid sequence of SEQ ID NO:52, and a VL having the amino acid sequence of SEQ ID NO:40;
- (n) a VH having the amino acid sequence of SEQ ID NO:52, and a VL having the amino acid sequence of SEQ ID NO:28;
- 5 (o) a VH having the amino acid sequence of SEQ ID NO:52, and a VL having the amino acid sequence of SEQ ID NO:20;
- (p) a VH having the amino acid sequence of SEQ ID NO:56, and a VL having the amino acid sequence of SEQ ID NO:32;
- (q) a VH having the amino acid sequence of SEQ ID NO:56, and a VL having the amino acid sequence of SEQ ID NO:36;
- 10 (r) a VH having the amino acid sequence of SEQ ID NO:56, and a VL having the amino acid sequence of SEQ ID NO:40;
- (s) a VH having the amino acid sequence of SEQ ID NO:56, and a VL having the amino acid sequence of SEQ ID NO:28;
- 15 (t) a VH having the amino acid sequence of SEQ ID NO:56, and a VL having the amino acid sequence of SEQ ID NO:20;
- (u) a VH having the amino acid sequence of SEQ ID NO:24, and a VL having the amino acid sequence of SEQ ID NO:32;
- (v) a VH having the amino acid sequence of SEQ ID NO:24, and a VL having the amino acid sequence of SEQ ID NO:36; or
- 20 (w) a VH having the amino acid sequence of SEQ ID NO:24, and a VL having the amino acid sequence of SEQ ID NO:40.
5. The antibody or antigen-binding fragment of any one of claims 1-4, further comprising:
- 25 (a) a heavy chain constant region having the amino acid sequence of SEQ ID NO:59, 60, 61, 62, 63, 64, 65, 66, 67, or 68; and
- (b) a light chain constant region having the amino acid sequence of SEQ ID NO:57 or 58.
6. The antibody or antigen binding fragment thereof of claim 1, comprising a VH-CDR1 comprising the amino acid sequence of SEQ ID NO:53; a VH-CDR2 comprising the amino acid sequence of SEQ ID NO:54; and a VH-CDR3 comprising the amino acid sequence of SEQ ID NO:55; and
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a VL-CDR1 comprising the amino acid sequence of SEQ ID NO:33; a VL-CDR2 comprising the amino acid sequence of SEQ ID NO:34; and a VL-CDR3 comprising the amino acid sequence of SEQ ID NO:35.

5 7. The antibody or antigen binding fragment thereof of claim 2, comprising a VH-CDR1, a VH-CDR2, and a VH-CDR3 of a VH comprising the amino acid sequence of SEQ ID NO:56; and a VL-CDR1, a VL-CDR2, and a VL-CDR3 of a VL comprising the amino acid sequence of SEQ ID NO:36.

10 8. The antibody or antigen binding fragment thereof of claim 4, comprising a VH comprising the amino acid sequence of SEQ ID NO:56 and a VL comprising the amino acid sequence of SEQ ID NO:36.

9. An antibody comprising:

15 (a) a light chain comprising the amino acid sequence of SEQ ID NO:71 and a heavy chain comprising the amino acid sequence of SEQ ID NO:72;

 (b) a light chain comprising the amino acid sequence of SEQ ID NO:73 and a heavy chain comprising the amino acid sequence of SEQ ID NO:74; or

20 (c) a light chain comprising the amino acid sequence of SEQ ID NO:75 and a heavy chain comprising the amino acid sequence of SEQ ID NO:76.

10. An antibody consisting of:

 (a) two light chains comprising the amino acid sequence of SEQ ID NO:71 and two heavy chains comprising the amino acid sequence of SEQ ID NO:72;

25 (b) two light chains comprising the amino acid sequence of SEQ ID NO:73 and two heavy chains comprising the amino acid sequence of SEQ ID NO:74; or

 (c) two light chains comprising the amino acid sequence of SEQ ID NO:75 and two heavy chains comprising the amino acid sequence of SEQ ID NO:76.

30 11. An antibody consisting of:

 (a) two light chains consisting of the amino acid sequence of SEQ ID NO:71 and two heavy chains consisting of the amino acid sequence of SEQ ID NO:72;

(b) two light chains consisting of the amino acid sequence of SEQ ID NO:73 and two heavy chains consisting of the amino acid sequence of SEQ ID NO:74; or

(c) two light chains consisting of the amino acid sequence of SEQ ID NO:75 and two heavy chains consisting of the amino acid sequence of SEQ ID NO:76.

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12. The antibody or antigen binding fragment thereof of any one of claims 1-8, having an equilibrium dissociation constant (KD) of 1×10^{-8} M or less, 9×10^{-9} M or less, 8×10^{-9} M or less, 7×10^{-9} M or less, 6×10^{-9} M or less, 5×10^{-9} M or less, 4×10^{-9} M or less, 3×10^{-9} M or less, or 2×10^{-9} M or less, for tau-pS413.

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13. The antibody or antigen binding fragment thereof of claim 12, having an KD of 2×10^{-9} M or less for tau-pS413.

14. The antibody or antigen binding fragment thereof of claim 12 or 13, wherein the KD is measured by Biacore with the antibody or antigen binding fragment thereof being immobilized.

15. An isolated nucleic acid, encoding:

(a) the VH of the antibody or antigen binding fragment thereof of any one of claims 1-14;

(b) the VL of the antibody or antigen binding fragment thereof of any one of claims 1-14;

20 (c) the VH and the VL of the antibody or antigen binding fragment thereof of any one of claims 1-14;

(d) the heavy chain of the antibody or antigen binding fragment thereof of any one of claims 1-14;

(e) the light chain of the antibody or antigen binding fragment thereof of any one of

25 claims 1-14; or

(f) the heavy chain and the light chain of the antibody or antigen binding fragment thereof of any one of claims 1-14.

16. An expression vector comprising the isolated nucleic acid of claim 15.

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17. A host cell comprising the isolated nucleic acid of claim 15 or the expression vector of claim 16.

18. A method of producing an antibody or antigen binding fragment thereof, comprising:
(a) culturing the host cell of claim 17;
(b) expressing the expression vector of claim 16; or
(c) expressing the isolated nucleic acid of claim 15,
5 under conditions wherein the antibody or antigen binding fragment thereof is expressed.
19. A composition comprising the antibody or antigen binding fragment thereof of any one of claims 1-14, and a pharmaceutically acceptable carrier.
- 10 20. A kit comprising the antibody or antigen binding fragment thereof of any one of claims 1-14.
21. A method of treating tauopathy in a subject, comprising administering to the subject an effective amount of the antibody or antigen binding fragment thereof of any one of claims 1-14
15 or the composition of claim 19.
22. The method of claim 21, wherein the tauopathy is Alzheimer's disease, corticobasal degeneration, progressive supranuclear palsy, Pick's disease, argyrophilic grain dementia (argyrophilic grain disease), multiple system tauopathy with presenile dementia (MSTD),
20 frontotemporal dementia and parkinsonism linked to chromosome 17 (FTDP-17), dementia with neurofibrillary tangles, diffuse neurofibrillary tangle with calcification (DNTC), white matter tauopathy with globular glial inclusions (WMT-GGI), frontotemporal lobar degeneration with tau pathology (FTLD-tau), Economo's encephalitis sequela, subacute sclerosing panencephalitis, or boxer's encephalopathy.
- 25 23. A method of decreasing the amount of tau-pS413 in the brain of a subject, comprising administering to the subject in need thereof an effective amount of the antibody or antigen binding fragment thereof of any one of claims 1-14 or the composition of claim 19.
- 30 24. The method of claim 21 or 23, further comprising administering to the subject an additional agent.
25. The composition of claim 19, further comprising an additional agent.

26. The method of claim 24 or the composition of claim 25, wherein the additional agent is selected from the group consisting of cholinesterase inhibitors, donepezil, galantamine, rovastigmine, tacrine, NMDA receptor antagonists, memantine, amyloid beta peptide aggregation inhibitors, antioxidants, gamma-secretase modulators, nerve growth factor (NGF) mimics or NGF gene therapy, PPAR γ agonists, HMS-CoA reductase inhibitors, statins, ampakines, calcium channel blockers, GABA receptor antagonists, glycogen synthase kinase inhibitors, intravenous immunoglobulin, muscarinic receptor agonists, nicotinic receptor modulators, active or passive amyloid beta peptide for immunization, phosphodiesterase inhibitors, serotonin receptor antagonists, anti-amyloid beta peptide antibodies, growth hormone, neurotrophic factor, brain-derived neurotrophic factor (BDNF), nerve growth factor (NGF), neurotrophin-4/5, fibroblast growth factor (FGF)-2 and other FGFs, neurotrophin (NT)-3, erythropoietin (EPO), hepatocyte growth factor (HGF), epidermal growth factor (EGF), transforming growth factor (TGF)- α 1, TGF- β , vascular endothelial growth factor (VEGF), interleukin-1 receptor antagonist (IL-1ra), ciliary neurotrophic factor (CNTF), glial-derived neurotrophic factor (GDNF), neurturin, platelet-derived growth factor (PDGF), heregulin, neuregulin, artemin, persephin, interleukins, glial cell line derived neurotrophic factor (GFR), granulocyte-colony stimulating factor (CSF), granulocyte-macrophage-CSF, netrins, cardiotrophin-1, hedgehogs, leukemia inhibitory factor (LIF), midkine, pleiotrophin, bone morphogenetic proteins (BMPs), netrins, saposins, semaphorins, stem cell factor (SCF), or a different anti-tau antibody, or a combination thereof.
27. Use of the antibody or antigen binding fragment thereof of any one of claims 1-14 to treat tauopathy in a subject.
28. Use of the antibody or antigen binding fragment thereof of any one of claims 1-14 for the treatment of tauopathy in a subject.
29. Use of the antibody or antigen binding fragment thereof of any one of claims 1-14 for the preparation of a medicament to treat tauopathy in a subject.
30. The use of any one of claims 27-29, wherein the tauopathy is Alzheimer's disease, corticobasal degeneration, progressive supranuclear palsy, Pick's disease, argyrophilic grain

dementia (argyrophilic grain disease), multiple system tauopathy with presenile dementia (MSTD), frontotemporal dementia and parkinsonism linked to chromosome 17 (FTDP-17), dementia with neurofibrillary tangles, diffuse neurofibrillary tangle with calcification (DNTC), white matter tauopathy with globular glial inclusions (WMT-GGI), frontotemporal lobar
5 degeneration with tau pathology (FTLD-tau), Economo's encephalitis sequela, subacute sclerosing panencephalitis, or boxer's encephalopathy.

31. The antibody or antigen binding fragment thereof of any one of claims 1-14 for use in a method for treating tauopathy in a subject.

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32. The antibody or antigen binding fragment thereof of any one of claims 1-14 for use in a method for diagnosing tauopathy in a subject.

33. The antibody or antigen binding fragment thereof of claim 31 or 32, wherein the
15 tauopathy is Alzheimer's disease, corticobasal degeneration, progressive supranuclear palsy, Pick's disease, argyrophilic grain dementia (argyrophilic grain disease), multiple system tauopathy with presenile dementia (MSTD), frontotemporal dementia and parkinsonism linked to chromosome 17 (FTDP-17), dementia with neurofibrillary tangles, diffuse neurofibrillary tangle with calcification (DNTC), white matter tauopathy with globular glial inclusions (WMT-GGI),
20 frontotemporal lobar degeneration with tau pathology (FTLD-tau), Economo's encephalitis sequela, subacute sclerosing panencephalitis, or boxer's encephalopathy.