

Listing 1: NeuroML File for EGL-19 Voltage-Gated Calcium Channel.

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <neuroml xmlns="http://www.neuroml.org/schema/neuroml2"
3   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4   xsi:schemaLocation="http://www.neuroml.org/schema/neuroml2 https://raw.
   github.com/NeuroML/NeuroML2/master/Schemas/NeuroML2/NeuroML_v2beta.xsd
   "
5   id="ca_boyle">
6
7   <ionChannel id="ca_boyle" conductance="10pS" type="ionChannelHH" species="ca">
8
9     <notes>Ca channel from Boyle and Cohen 2008</notes>
10
11     <gateHHtauInf id="e" instances="2">
12
13       <timeCourse type="fixedTimeCourse" tau="0.100027 ms"/>
14       <steadyState type="HHSigmoidVariable" rate="1" scale="6.74821 mV"
15         midpoint="-3.3568 mV"/>
16
17     </gateHHtauInf>
18
19     <gateHHtauInf id="f" instances="1">
20
21       <timeCourse type="fixedTimeCourse" tau="150.88 ms"/>
22
23       <!-- Note!!!
24
25         f gate is "inactivation" a/c B&C 2008 p172
26         but the scale value from Table A1 (kf) is positive (5mV), i.e.
27         steady
28         state is zero for v << midpoint and 1 for v >> midpoint
29         Couple this with a very slow time course & the ion channel never
30         conducts as e^2 x f is always ~0
31
32         Using -5.03176mV NOT 5mV for k/scale to make this INACTIVATION
33
34         This is suggested by the value used here:
35         https://github.com/openworm/muscle_model/blob/master/BoyleCohen2008
36         /MatlabSupport/Main_Version/data/input.csv#L20
37
38         see also
39         https://github.com/openworm/muscle_model/blob/master/BoyleCohen2008
40         /PythonSupport/Main_Version/compareToNeuroML2.py
41
42         -->
43       <steadyState type="HHSigmoidVariable" rate="1" scale="-5.03176 mV"
44         midpoint="25.1815 mV"/>
45
46     </gateHHtauInf>
47
48     <customHGate id="h" instances="1" alpha="0.282473" ca_half="6.41889e-8 mM"
49       k="-1.00056e-8 mM"/>
50
51   </ionChannel>

```

```

45 <ComponentType name="customHGate"
46     extends="gateHHtauInf"
47     description="Custom gate for h">
48
49     <Parameter name="alpha" dimension="none"/>
50     <Parameter name="k" dimension="concentration"/>
51     <Parameter name="ca_half" dimension="concentration"/>
52
53
54     <Constant name="SEC" dimension="time" value="1s"/>
55
56
57     <Exposure name="tau" dimension="time"/>
58     <Exposure name="inf" dimension="none"/>
59
60     <Requirement name="caConc" dimension="concentration"/>
61
62     <Dynamics>
63
64         <DerivedVariable name="rateScale" exposure="rateScale" dimension="none"
65             value="1"/>
66
67         <DerivedVariable name="inf" dimension="none" exposure="inf" value="1 /
68             (1 + (exp( (ca_half - caConc) / k)))"/>
69
70         <DerivedVariable name="tau" dimension="time" exposure="tau" value="0 *
71             SEC"/>
72         <DerivedVariable name="q" exposure="q" dimension="none" value="inf"/>
73         <DerivedVariable name="fcond" exposure="fcond" dimension="none" value="
74             1 + ((q-1) * alpha)"/>
75     </Dynamics>
76 </ComponentType>
</neuroml>

```