Multicompartment Model Stress Testing

11 March 2021

# Test 1 – Two identical compartments

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| Aim: | Determine if the compartments:   1. Reach a steady state 2. Are identical 3. Final values are similar to Kira’s single compartment |
| Starting values (all defaults): |  |
| Run time: | 10 minutes |
| Final values: |  |
| Relevant graphs: |  |
| Boundary steady state graph: |  |
| Conclusion: | Compartments reach steady state (almost) and behave identically.  Steady state values are identical to Kira’s model |

# Test 2- Two compartments, one with altered ionic concentrations

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| Aim/  Prediction | 1. Compartments will reach a steady state 2. The final steady state values will be the same as in Test 1 (as expected by the analytical solution) |
| Starting values (all defaults): |  |
| Run time: | 15 minutes |
| Final values: |  |
| Relevant graphs: |  |
| Boundary steady state graph: |  |
| Conclusion: | Compartments reach steady state (nearly – just needed to let it go a little longer)  Compartments behave identically.  Changes to the ionic concentrations make no difference to the steady state values (as expected by the analytical solution)  Steady state values are identical to Kira’s model |

# Test 3 – Two compartments, one with altered average impermeant concentration

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| Aim/  Prediction | 1. Compartments will reach a steady state 2. The final steady state values will be the same as in Test 1 (as expected by the analytical solution) 3. The compartment with more impermeant anions in the beginning will have a larger volume |
| Starting values (all defaults): |  |
| Run time: | 20 minutes |
| Final values: |  |
| Relevant graphs: |  |
| Boundary steady state graph: |  |
| Conclusion: | Compartments reach steady state  Changes to the impermeant anion concentrations make no difference to the steady state values (as expected by the analytical solution)  Steady state values are identical to Kira’s model.  Larger volume in compartment with more impermeants |

# Test 4 – Two compartments, one with altered impermeant average charge

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| Aim/  Prediction | 1. Non-isopotential steady state 2. Chloride driving force will be different between the 2 compartments 3. Steady state ion concentrations will be different in the 2 compartments |
| Starting values (all defaults): |  |
| Run time: | 20 minutes |
| Final values: |  |
| Relevant graphs: |  |
| Boundary steady state graph: |  |
| Conclusion: | * Compartments are non-isopotential (comp 1 = -72mV, comp2 = -70mV) * Different chloride driving forces (Comp1 = 12.87mV, Comp2 = 15.96mV) * Different volumes * All ions have different steady state values between compartments * Neat loops of ion fluxes between compartments and membrane to create the steady state non-isopotential scenario |

# Test 5: Three compartments, compartment in middle with altered average impermeant charge

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| Prediction: | * Observe same loop phenomena as in test 4. * Should see the loop extending for the entire three compartments * Expect compartment 1 and compartment 3 to be identical |
| Starting values:  Comp1 = default  Comp2 =  Altered z  Comp3 =  default |  |
| Run time | 25 minutes |
| Final values: |  |
| Relevant graphs |  |
| Steady state boundaries |  |
| Conclusion |  |