A Kappa model for hepatic stellate cells activation by TGFB1

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Hepatic Stellate Cells; the drivers of tissue repair and fibrosis
Kappa

Rule-based language for modeling systems of interacting agents (https://kappalanguage.org/)

Entities are graphical structures, rules are graph-rewrite directives.

Rules locally modify the state of a system

\[ \text{HSC}(\text{state}(\text{quiescent}) \text{TGFBR1}_2(\text{membrane}[.]), \text{TGFB1}(\text{cell}[,\text{state}(\text{active}))) \rightarrow \text{HSC}(\text{state}(\text{quiescent}) \text{TGFBR1}_2(\text{intern}[1]), \text{TGFB1}(\text{cell}[1] \text{state}(\text{active})) @ 'Vr' * 'fixing\_cell' \]
Acute simulation

1 input of TGFB at 100 hours

60 inputs of TGFB each 24 hours
Conclusion

- reverted HSC (iHSC) are key regulators
- TGFB1 is necessary to induce HSC activation but doesn’t allow to reach a fibrotic state characterised by persistent high level of MFB

**Hypothesis**: extracellular matrix contribute to the sustained activation of HSCs?

A New model to develop!
Thank you for your attention