Reviewer's report

Title: Anti-stress and neuronal cell differentiation induction effects of Rosmarinus officinalis L. essential oil

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Reviewer: Andrea Bugarcic

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This is an interesting study that looked at the effect of essential oils in vivo and in vitro. The conclusions from the in vitro study show elevation of the stress response, while in vitro experiments speak to the neuronal plasticity. These two conclusions may be a completely separate conclusions or may be connected through the nervous-endocrine system interaction, but this needs to be stated fully in the paper. Currently, the conclusions are putting the two conclusions together and no testable model has been suggested on the interrelationship of these two findings.

Experimentally:

1. TST assay was done without appropriate controls (both negative and positive - can another compound or situation act as a positive control for the assay itself?, also no control was used where immobility was increased)
2. why are corticosterone levels and immobilization times (Fig 1 a and b) at 50ul and 100ul showing inverse relationship?
3. Figure 2a shows increase in PC12 numbers in the presence of 5 and 10ug/ml ROEO while 2b shows increased AcHE activity similar the the level of cell number increase. NGF is known to act on division cycle - is this also the case with ROEO? What are cell numbers at the point of assay? Simple counting of the cells in the Fig 3b may suggest the increase in numbers is also contributing the level of AcHE activity assay - this needs to be addressed for publication.
4. Figure 3b - the outgrowths are difficult to see. It would be more convincing if the outgrowths were quantified and better contrasting picture presented.
5. formatting issue - Figure 4 - x-axis does not need to have 2 label types for the same message

The paper adds to the body of knowledge and has a potential to unlock the level of different system involvement and molecular pathways influenced by the EOs in a range of mental and neurodegenerative disorders (e.g. authors note the different NT secretion in presence of different
The experimental data needs to be addressed as above and a presentation of a testable model would be beneficial to see.

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

No

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

Yes

**Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?**
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

**Quality of written English**
Please indicate the quality of language in the manuscript:

Needs some language corrections before being published

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