

Investigation of Aryl Hydrocarbon Receptor (AhR) Ligand (TCDD) Regulated Immune Suppression in mice

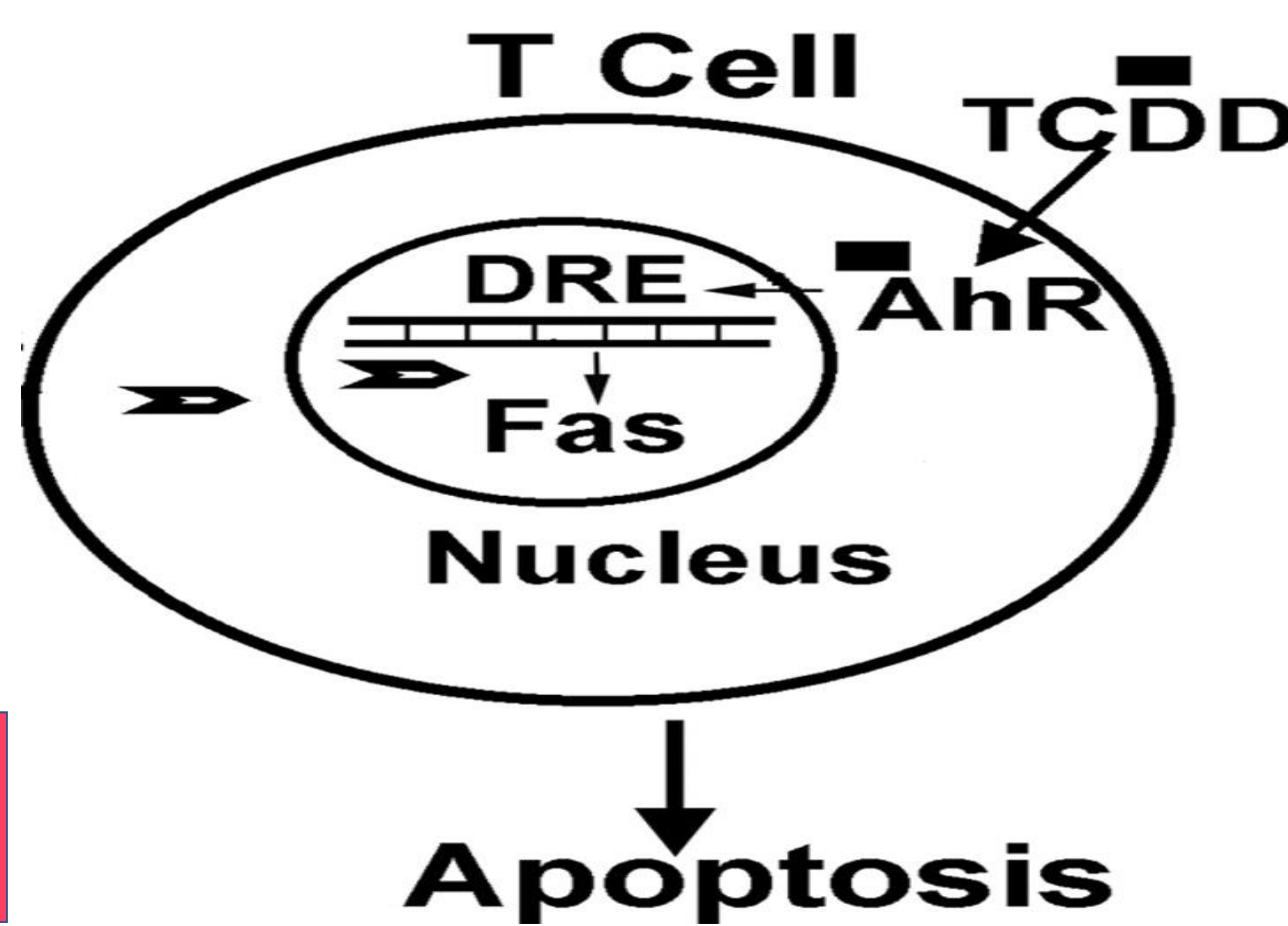


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Background

AhR is a transcription factor that is activated by various ligands. It has recently been investigated for the role it plays in the immune system and with inflammation. Activation of the AhR receptor causes immunotoxicity and atrophy of the thymus and generates numerous immunosuppressive cells.

TCDD is a known AhR ligand that causes harmful immunological effects. It is one of the most toxic compounds ever created.



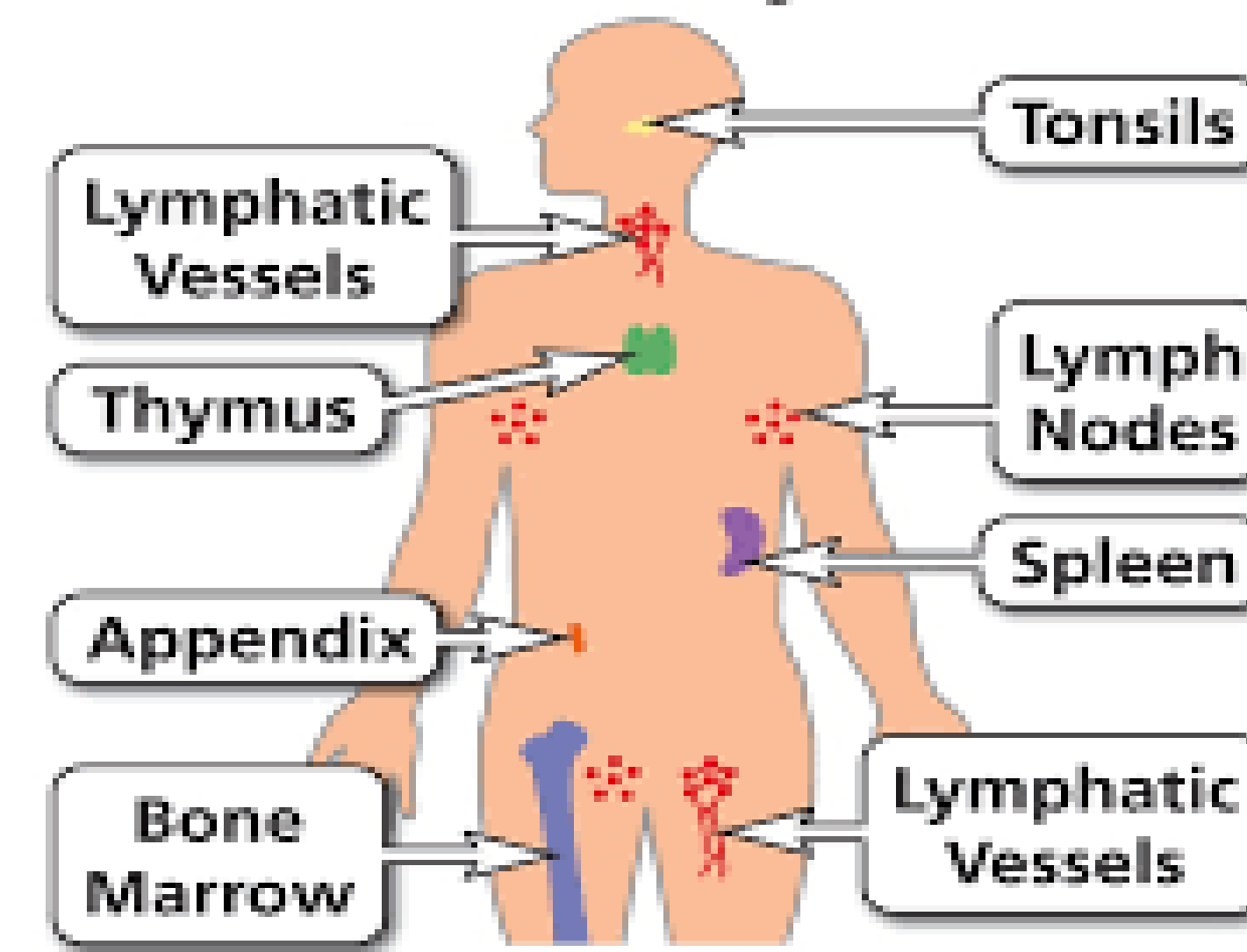
Objective

The objective of this research was to investigate the effect of AhR ligands such as TCDD on the immune system.

Methods

C57BL/6 mice were treated with TCDD (50 µg/kg bw) or vehicle by oral gavage or intraperitoneal injection. Three days after treatment, mice were sacrificed and the thymus, spleen, draining lymph nodes, and peritoneal cavity exudates were collected. Thymic cells were stained for several surface markers, to determine which subpopulations were undergoing programmed cell death.

Immune System



Results

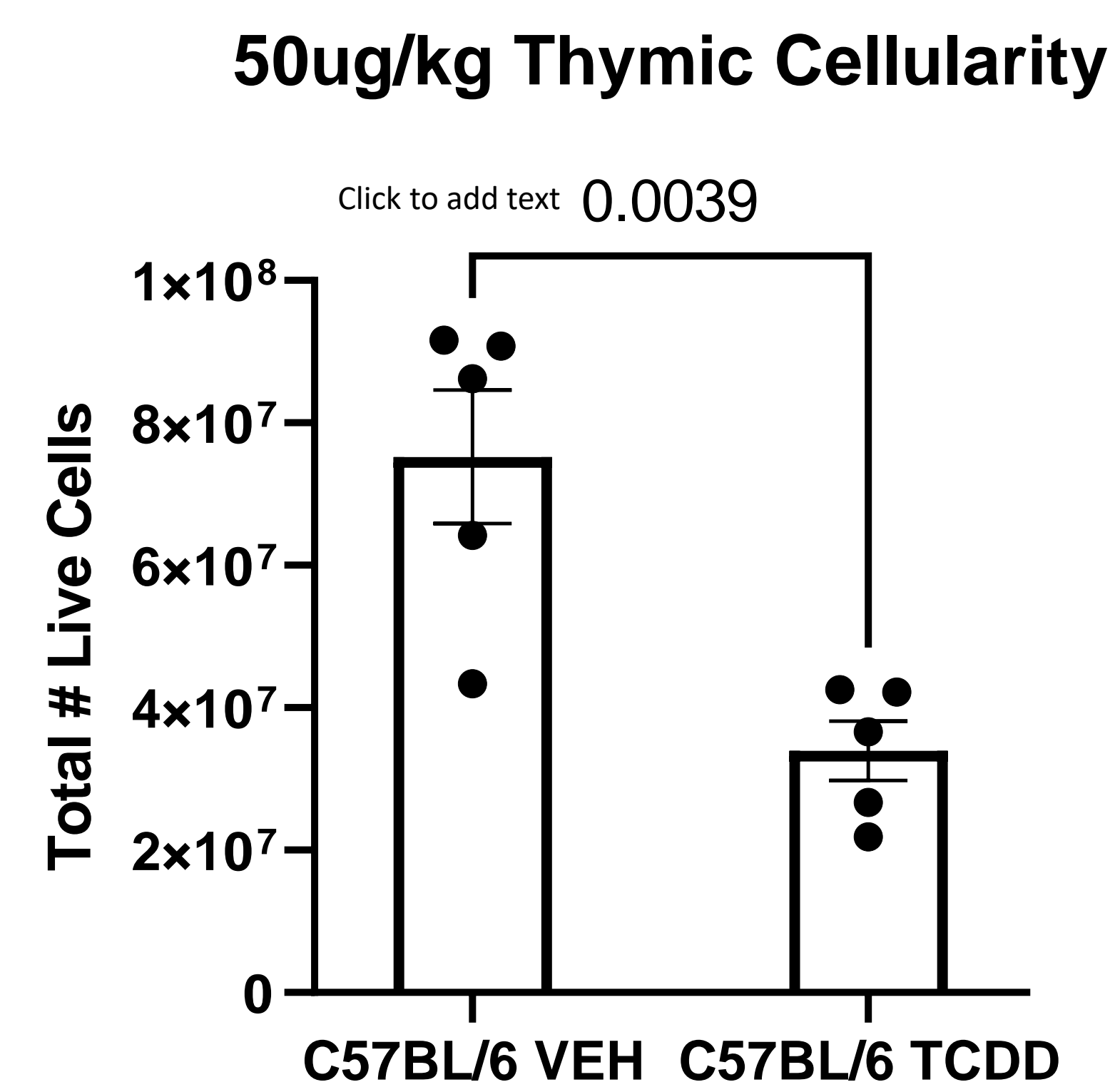


Figure 1: Shows thymic cellularity.

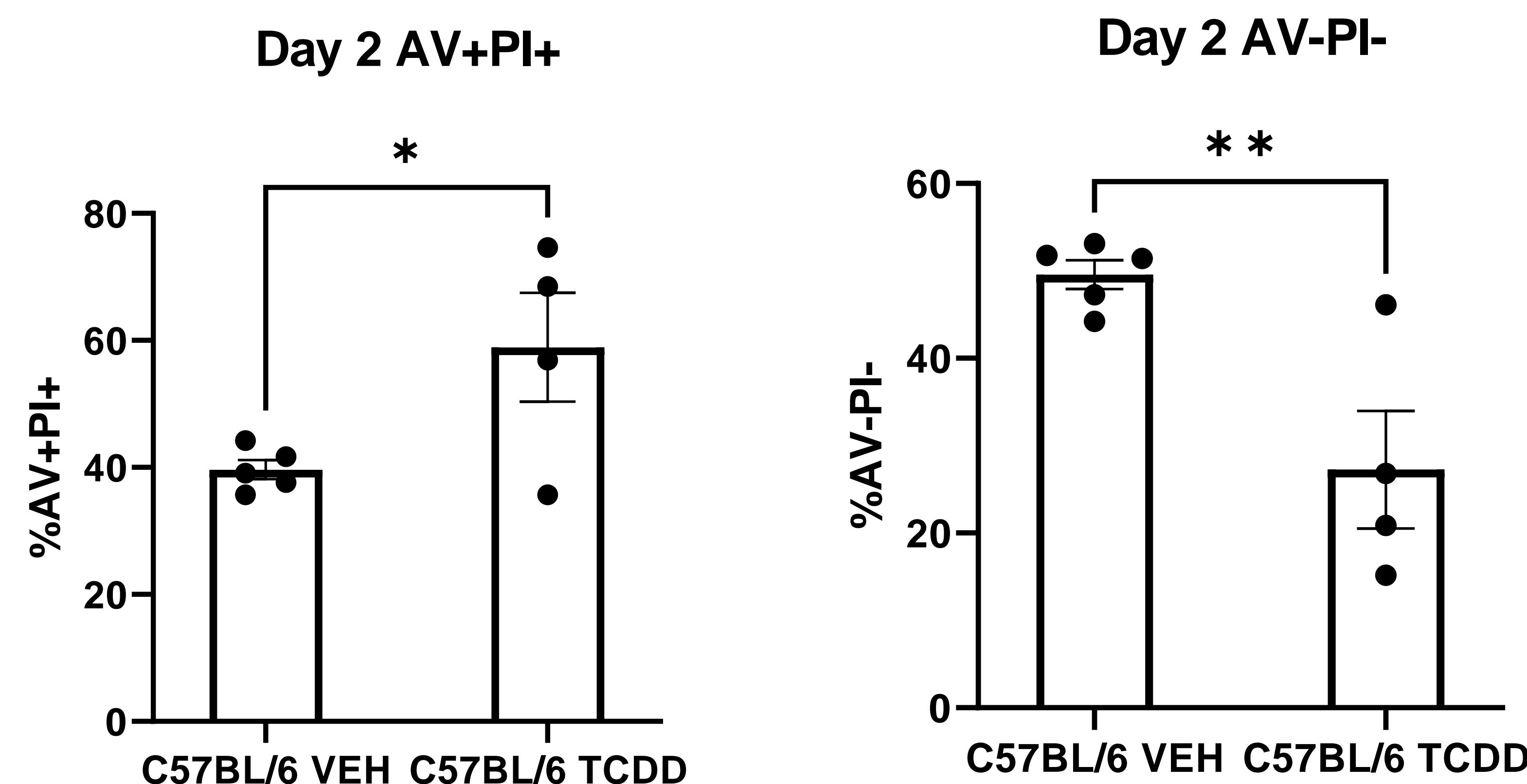


Figure 2: Shows late apoptosis.

Figure 3: Shows live cells.

Conclusion

TCDD induced apoptosis in the thymus leading to thymic atrophy and immunosuppression.

Future Direction

In the future, we could treat the mice in conjunction with other AhR ligands such as resveratrol, indoles etc to determine if they can ameliorate the effects of TCDD.

References

- Rothhammer, Veit, and Francisco J. Quintana. "The Aryl Hydrocarbon Receptor: an Environmental Sensor Integrating Immune Responses in Health and Disease." *Nature Reviews Immunology*, vol. 19, no. 3, Apr. 2019, pp. 184–197., doi:10.1038/s41577-019-0125-8.
- Prasad Singh, N., Nagarkatti, M., & Nagarkatti, P. (2020). From Suppressor T cells to Regulatory T cells: How the Journey That Began with the Discovery of the Toxic Effects of TCDD Led to Better Understanding of the Role of AhR in Immunoregulation. *International journal of molecular sciences*, 21(21), 7849. <https://doi.org/10.3390/ijms21217849>

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