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# Compounded Gabapentin for Felines: Associated Metabolic Processes and Analysis of Potency

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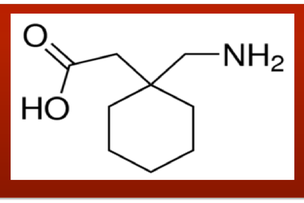
## Project Goals

1. To provide a review of the literature on veterinary compounding, its need and limitations.
2. To research the use of gabapentin to manage feline pain and study its metabolic and pharmacokinetic profile.
3. To quantify the concentration of gabapentin in compounded formulations of the drug using HPLC.




Chemical structure of gabapentin (Image from Sigma-Aldrich)

Brand Name: Neurontin

**Compounding:** the preparation, mixing, assembling, packaging, or labeling of a drug completed by a pharmacist or physician (National Association of Boards of Pharmacy).

**USA Pharmacopeia Guidelines on Compounded Formulations:** a formulation must contain 90% to 110% of the labeled drug content in order to be acceptable. E.g., labeled drug content = 50 mg/mL so acceptable concentration range would be 45-55 mg/mL

## Pharmaceutical Compounding in Veterinary Medicine

**Compounding as an essential practice *(1)*:**

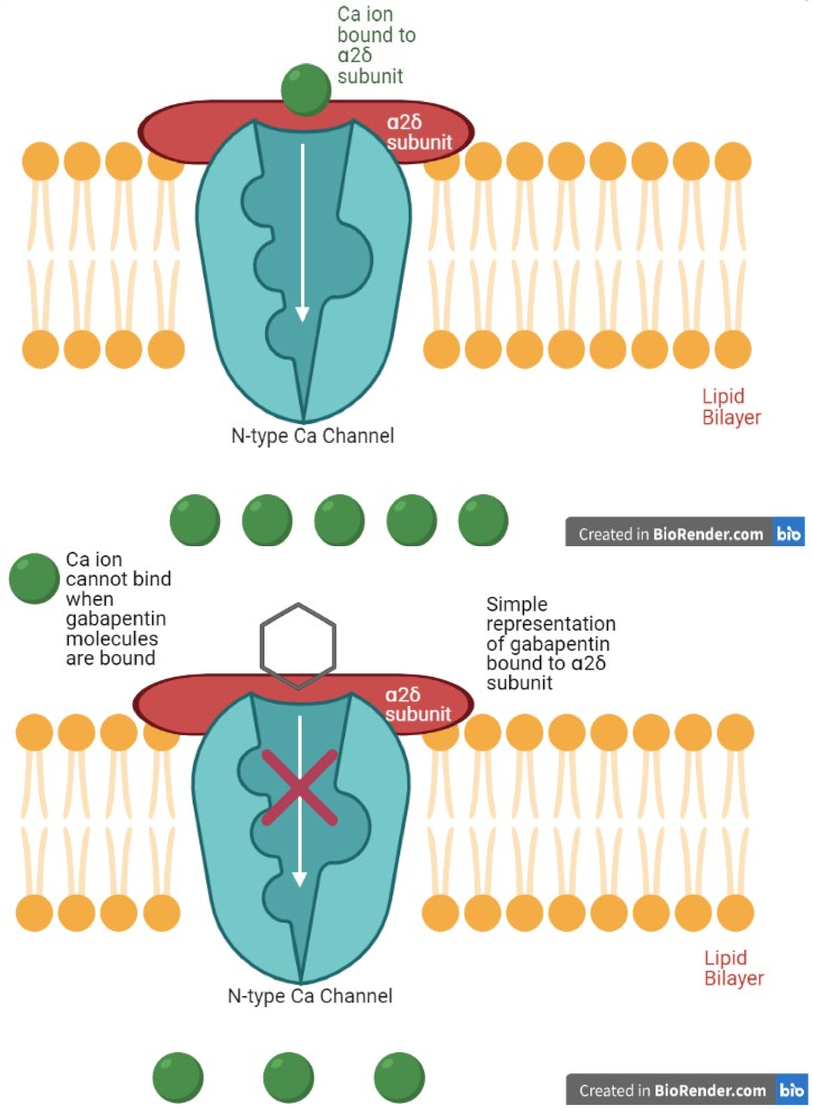
- Number of species to be treated
- Number of ailments to be addressed
- Minimal financial incentive for pharmaceutical companies to pursue veterinary drug approval

**A Documented Case of Veterinary Compounding Malpractice:**

*Burton et al., 2016 (2)*:

- Reduced frequency of neutropenia in canines taking compounded lomustine
- 21 dogs receiving FDA approved lomustine vs 16 dogs receiving compounded version. 71% vs 25% neutropenic, respectively.
- Follow-up study: samples of compounded lomustine from 5 compounding pharmacies acquired and potency was analyzed using HPLC with UV detection.
- Samples ranged in potency from 50 to 115% . Only 1 pharmacy out of 5 provided appropriately compounded lomustine.

## Plausible Mechanism of Action of Gabapentin *(3)*




| Pharmacokinetics of Gabapentin | $C_{MAX}$ (ug/mL) | $T_{MAX}$ (hours) |
|---|---|---|
| Felines *(4)* | 12.42 | 1.05 |
| Canines *(5)* | 8.54 | 1.30 |

## Experimental Approach to Analyzing Potency

1. Compounded formulations for potency assessment were purchased from 2 compounding pharmacies. 2 samples from each (one at 50mg/mL , the other at 100 mg/mL).
2. Standard gabapentin (Sigma Aldrich) was acquired and a series of 8 serial dilutions were made ranging in concentration from 1mg/mL to 10 mg/mL.
3. The mobile phase for the HPLC was a methanol – acetonitrile – potassium dihydrogen phosphate (pH5.2; 0.028 M) (25:10:65, v/v) solution. The HPLC was set to collect data at 210 nm and the flow rate was set to 1.00 mL/min which was set to remain consistent throughout data collection.
4. Aliquots of 25 µL of each of the eight serial dilutions were loaded into the HPLC and the area under the curve of the peak was collected.
5. Standard equation was formed and used to determine concentration following HPLC of experimental groups keeping HPLC parameters the same.

*Due to COID-19 restrictions, not enough data was generated prior to this conference to be presented.

## Conclusions and Future Directions

- More widespread studies investigating potency of compounded veterinary formulations.
- Push for more widespread oversight and regulation that matches the frequency of compounding to discourage malpractice.
- Species-specific pharmacological research in order to fill knowledge gaps and create species-specific models for treating various disorders.
- Regarding gabapentin specifically, studies aimed with finding the optimal plasma concentrations of the drug in cats and dogs are needed.

## Acknowledgements and References

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1. Boothe DM. Veterinary Compounding in Small Animals: A Clinical Pharmacologist's Perspective. *Veterinary Clinics of North America - Small Animal Practice*. 2006;36(5):1129-1173. doi:10.1016/j.cvsm.2006.07.003
2. Burton JH, Stanley SD, Knych HK, Rodriguez CO, Skorupski KA, Rebhun RB. Frequency and Severity of Neutropenia Associated with Food and Drug Administration Approved and Compounded Formulations of Lomustine in Dogs with Cancer. Journal of Veterinary Internal Medicine. 2016;30(1):242-246. doi:10.1111/jvim.13805
3. Boroujerdi A, Zeng J, Sharp K, Kim D, Steward O, Luo ZD. Calcium channel alpha-2-delta-1 protein upregulation in dorsal spinal cord mediates spinal cord injury-induced neuropathic pain states. Pain. 2011;152(3):649-655. doi:10.1016/j.pain.2010.12.014
4. Adrian D, Papich MG, Baynes R, Stafford E, Lascelles BDX. The pharmacokinetics of gabapentin in cats. Journal of Veterinary Internal Medicine. 2018;32(6):1996-2002. doi:10.1111/jvim.15313
5. KuKanich B, Cohen RL. Pharmacokinetics of oral gabapentin in greyhound dogs. *Veterinary Journal*. 2011;187(1):133-135. doi:10.1016/j.tvjl.2009.09.022