The uptake and release of GABA in human dental pulp

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Summary

Aims

The aims of this *in vitro* study were to determine whether;

- an uptake system for GABA exists in human dental pulp,
- GABA can be released from nerves in this tissue,
- functional $GABA_B$ autoreceptors are present.

Methods

Uptake studies

- Segments of vital pulp were incubated in [^{3}H]GABA (0.1-10μM) for up to 120min, washed, and the retained [^{3}H] extracted and assayed.
- Some tissues were treated with GABA uptake inhibitors (nipecotic acid or NO-711) prior to incubation.

Release studies

- Segments of vital pulp were incubated in [^{3}H]GABA (0.5μM) for 90min, and superfused with Krebs solution containing NO-711 (5μM).
- The effects of a $GABA_B$ autoreceptor agonist (baclofen) and antagonist (Sch 50911) were examined.

Results

Uptake studies

- At 0.1 and 1.0μM, the uptake of [^{3}H]GABA was saturated at 90 and 60 min respectively. At 10μM, at least two uptake compartments were apparent, one of which appeared to be saturated at approximately 40 min, whilst the other was not saturated even after 120 min.
- The maximal inhibition of [^{3}H]GABA uptake produced by NO-711 was 82% at a concentration of 50μM and by nipecotic acid 91% at 500μM. The EC_{50} for NO-711 was 2.6μM and for nipecotic acid 84μM.
- At the lowest concentration tested (0.1μM), nipecotic acid potentiated uptake.

Release studies

- [^{3}H]GABA was released from human dental pulp by electrical stimulation, with most of the release occurring during the period of stimulation. This release was Ca^{2+}-dependent.
- Baclofen inhibited the release of [^{3}H]GABA (EC_{50} = 3.8μM). Inhibition was maximal (67.1%) at 100μM.
- Sch 50911 enhanced the release of [^{3}H]GABA (EC_{50} = 3.2μM). Enhancement was maximal (74.7%) at 100μM. Sch 50911 (10μM) reversed the inhibitory effects of baclofen (5.0μM).

Conclusions

- The uptake studies imply that at least two uptake and storage compartments are present in human dental pulp which appear to be quite stable.
- Qualitative and quantitative evidence indicates that [^{3}H]GABA is released from neuronal sites.
- Functional $GABA_B$ autoreceptors, which modulate GABA release, are present in human dental pulp.