

Nucleus accumbens dopamine differentially mediates the formation and maintenance of monogamous pair bonds.

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Dopamine in nucleus accumbens.

- Prairie voles and meadow voles.
- Rostral shell → pair bonds.
- D1 receptor --| pair bond formation.
- D2 receptor → pair bond formation.
- Selective aggression via D1.
- Social organization.

Prairie voles.

- *Microtus ochrogaster*.
- Monogamous.
- Pair bond formation beans aggressive toward other mates.
- Maintain pair bond by reorganization.
- Permanent removal of partner.



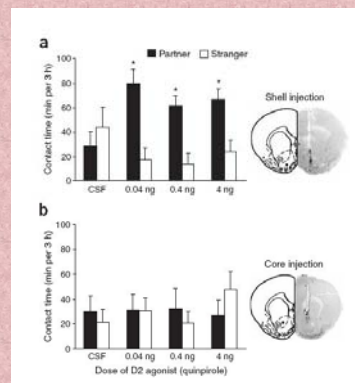
Nucleus accumbens.

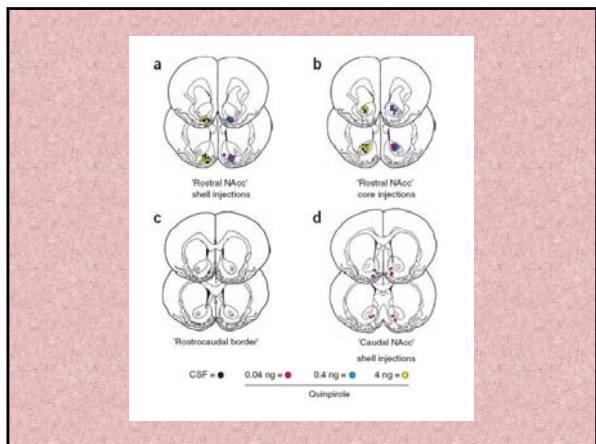
- Joins caudate to putamen.
- Across from septal nuclei.
- Dopamine system D1 and D2.
- Core and shell.



Pair bonds and D2 receptors.

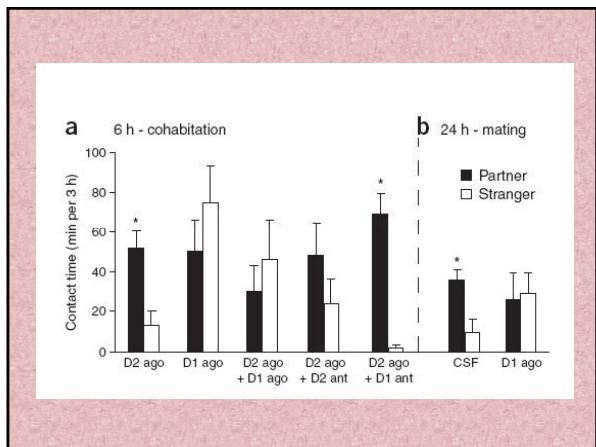
- 24 hours mating at will → preference.
- Quinpirole, a D2 agonist → preference.
- Smallest dose 0.04 ng best.
- Only effective when injected to rostral shell, not caudal to corpus callosum genu.
- CSF alone, 6 hours with female → none.





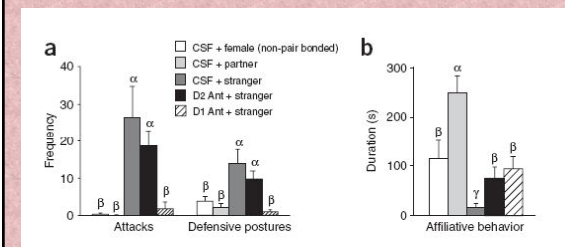
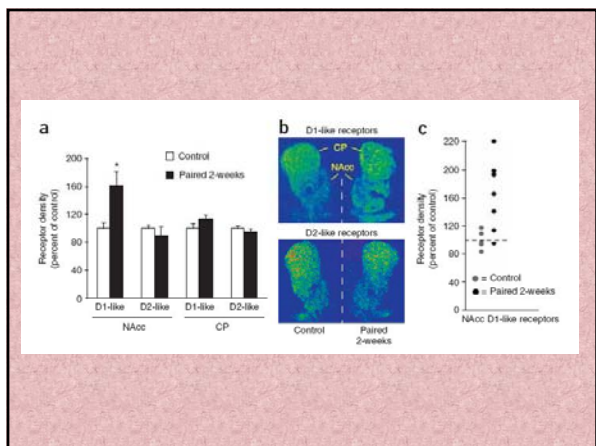
Pair bonds and D1 receptors.

- Low apomorphine → pair bond.
- D1 agonist SKF 38393 + D2 agonist quinpirole → no preference.
- D2 antagonist eticlopride + D2 agonist quinpirole → no preference.
- D1 antagonist SCH 23390 + D2 agonist quinpirole → pair bond.
- SKF 38393 blocked natural pair bond formation by 24 hour mating at will.
- Same number of matings in D1 agonist, control.



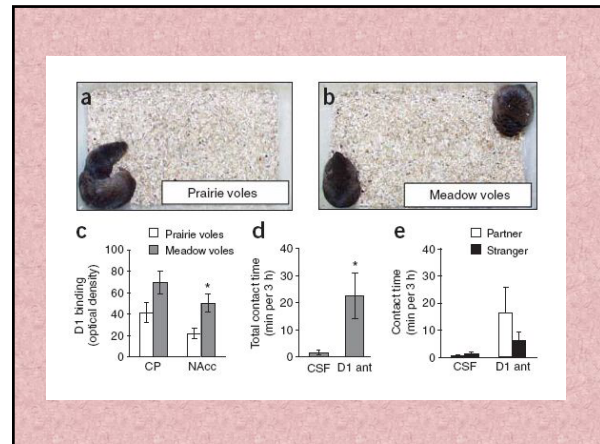
Accumbens reorganization.

- Receptor autoradiography in nucleus accumbens and caudate putamen.
- Pair bonded males had more D1 receptors in core and shell (combined data), but only after 2 weeks not 24 hours (maintenance).
- Resident intruder test for selective aggression.
- D1 block abolished aggression with same level of motor activity (grid crosses in open field test).



Comparative study.

- Meadow vole *Microtus pennsylvanicus*.
- Loners, less affiliative behavior.
- More D1 receptors in core, shell, caudate.
- D1 antagonist SCH 23390 (25 ng) → greater affiliative behavior, but did not pair bond.
- Social behavior is species-specific.



Summary discussion.

- Pair bonding as learning reward (drugs).
- D1 receptor for maintenance as memory.
- Vasopressin receptors in ventral pallidum → social behavior, D2 antagonist block.
- Mechanism specific for second pair bond?
- D1 receptor distributions?
- Recognition system?