Octopamine regulates social behaviors between genetically unrelated ant queens.

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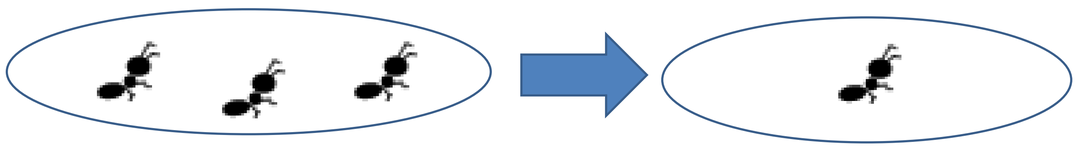
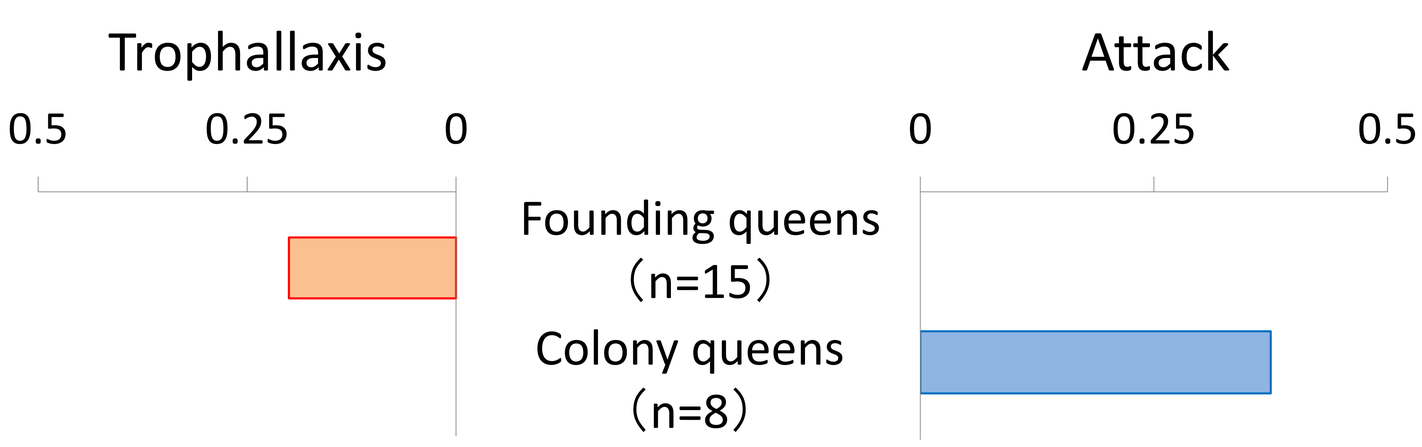
Many empirical and theoretical researches have been conducted to reveal ultimate cause of the evolution and the maintenance of cooperation. However, despite the importance, the neural mechanism underlying the maintenance, or inversely disappearance, of the cooperative behaviours is poorly understood.

Background (*Polyrhachis moesta* queen)

Colony foundation by multiple unrelated queens



Single queens in mature colonies



Toward another queen,
- founding queens are cooperative
- colony queens are aggressive

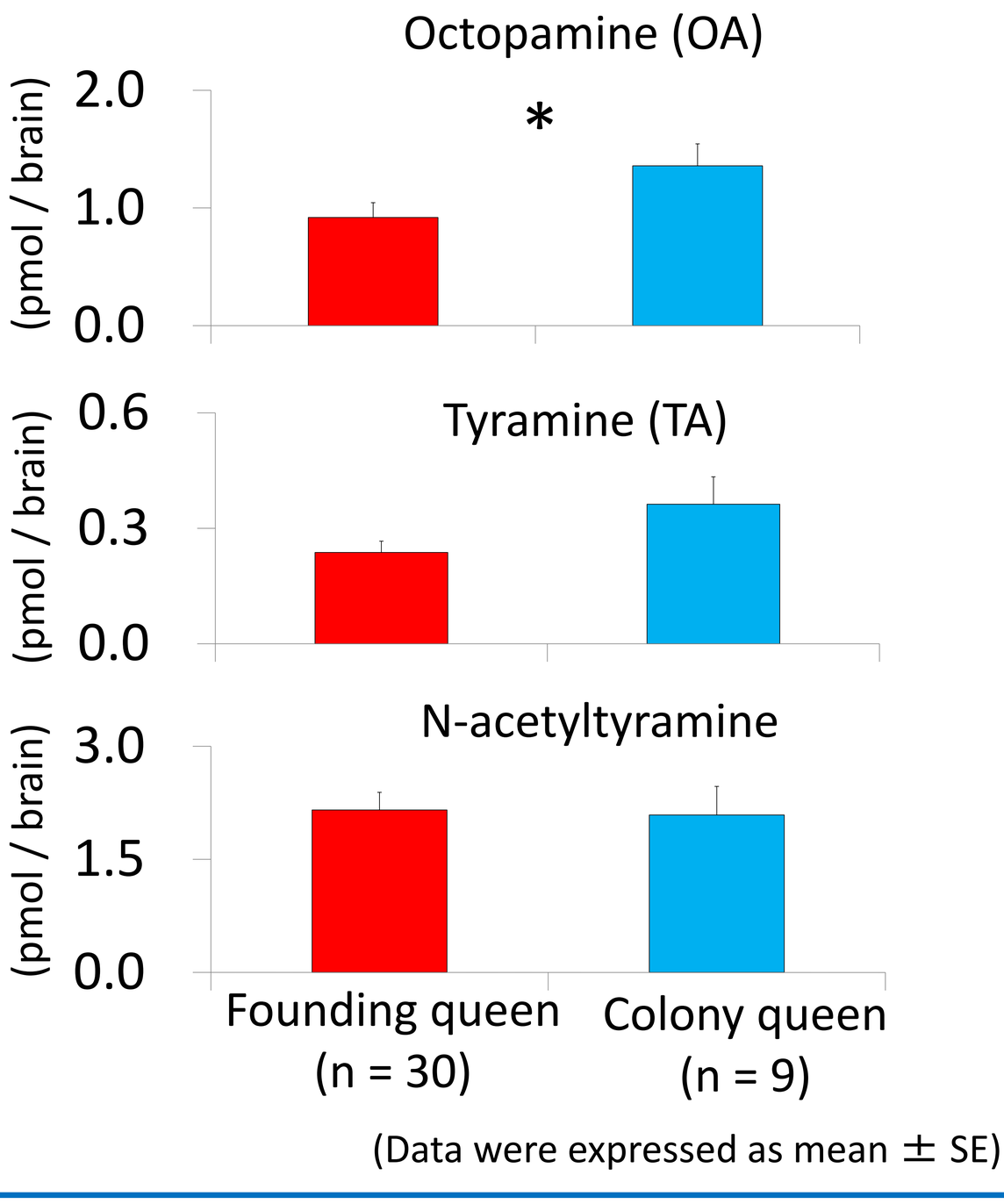
(Sasaki *et al*., 1996, 2005, Hashimoto*et al*., 2013)

Object

To reveal the mechanism of disappearance of cooperation in *Polyrhachis moesta* queens.

Exp.1

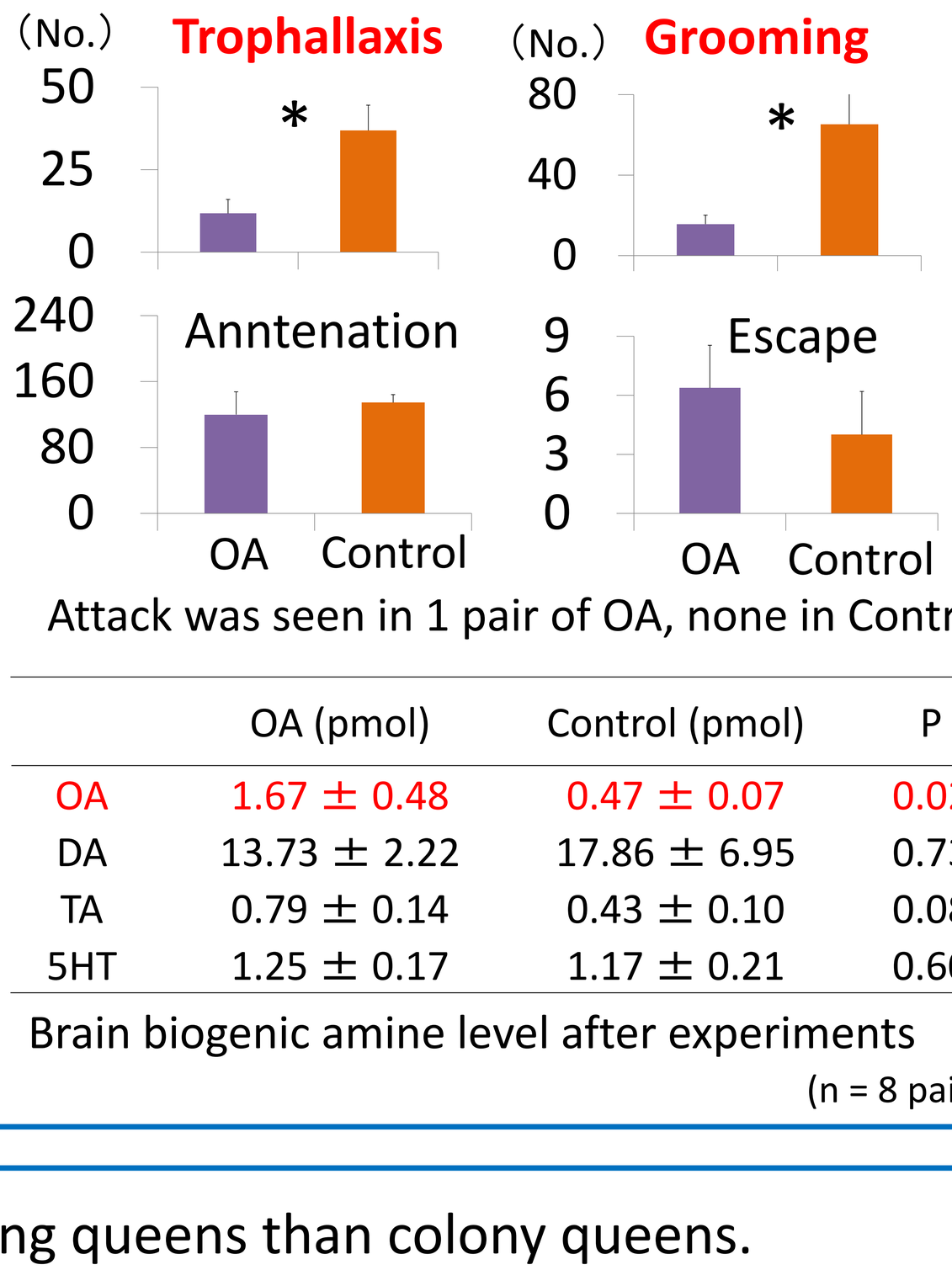
Brain biogenic amine levels of founding and colony queens were measured



(Data were expressed as mean ± SE)

Exp.2

Queens' behaviours were observed after OA adminitrations for 24 hrs



Attack was seen in 1 pair of OA, none in Control

	OA (pmol)	Control (pmol)	P
OA	1.67 ± 0.48	0.47 ± 0.07	0.02
DA	13.73 ± 2.22	17.86 ± 6.95	0.73
TA	0.79 ± 0.14	0.43 ± 0.10	0.08
5HT	1.25 ± 0.17	1.17 ± 0.21	0.60

Brain biogenic amine level after experiments

(n = 8 pairs)

Conclusion

- Brain octopamine level is higher in founding queens than colony queens.
- Octopamine inhibits cooperative behaviours (trophallaxis and grooming).
- Octopamine has no significant effects on aggressive behaviours (escape and attack)