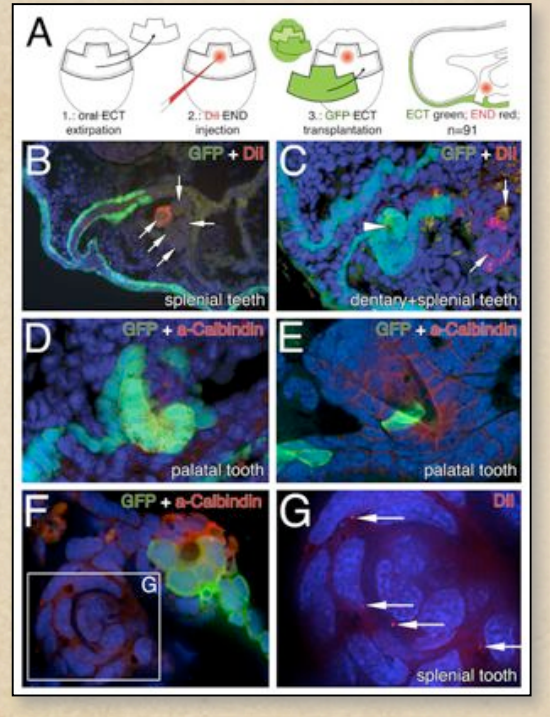
Orální zuby vznikají z ektodermu, entodermu i obou zárodečných vrstev: evo-devo implikace



Vladimír Soukup
Hans-H. Epperlein
Ivan Horáček
Robert Černý*

Kat. zoologie Př.F. UK
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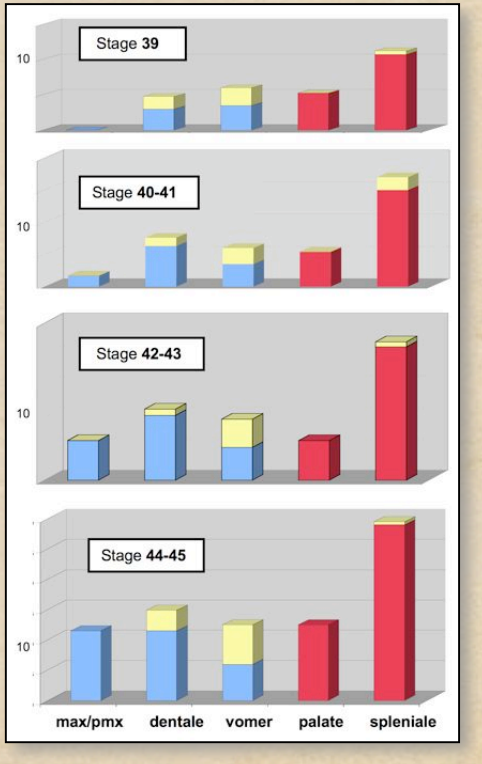
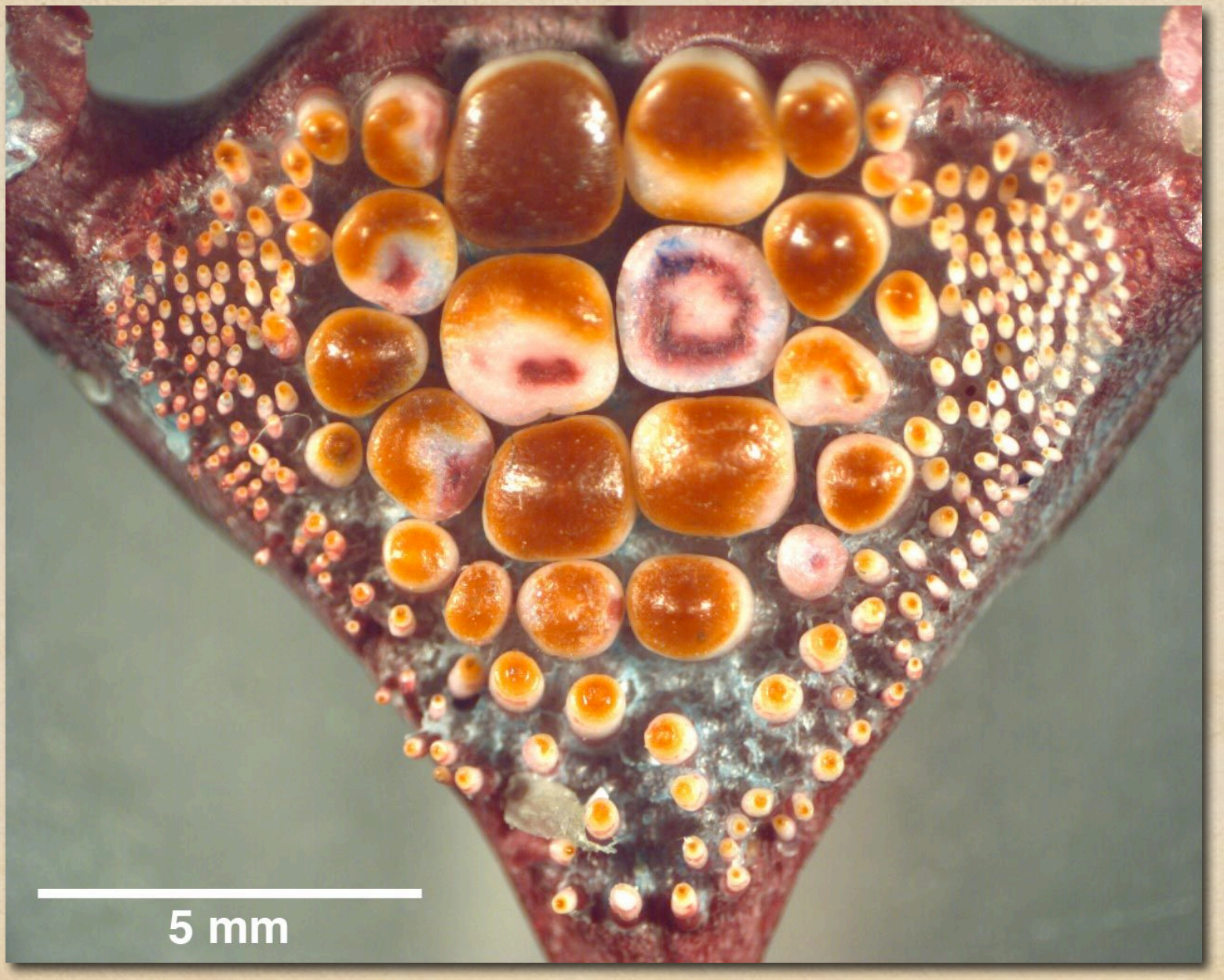
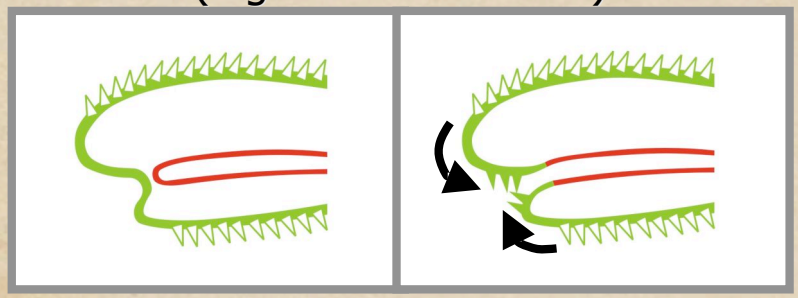



5 mm

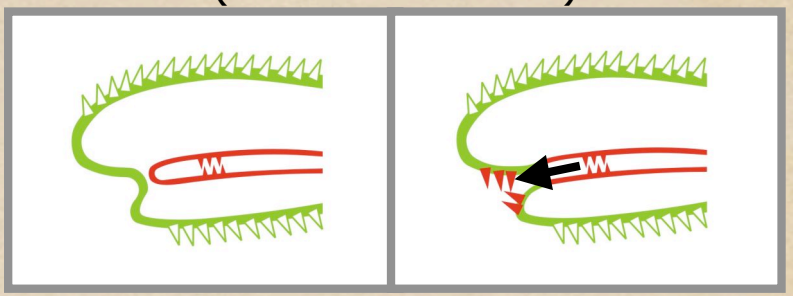
Germ layer origin of teeth in the context of evolutionary theories

Teeth from ECTODERM
(e.g. *sensu* W.E. Reif)



Dermal denticles of ECT origin migrated into the stomodeum, where they became teeth

Teeth from ENDODERM
(*sensu* M.M. Smith)



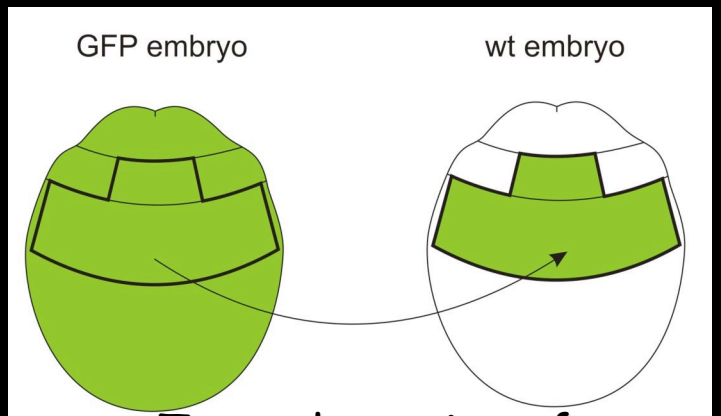
Pharyngeal denticles of END origin were later co-opted for ECT areas

Tooth = **ECTODERM** + **NEURAL CREST**

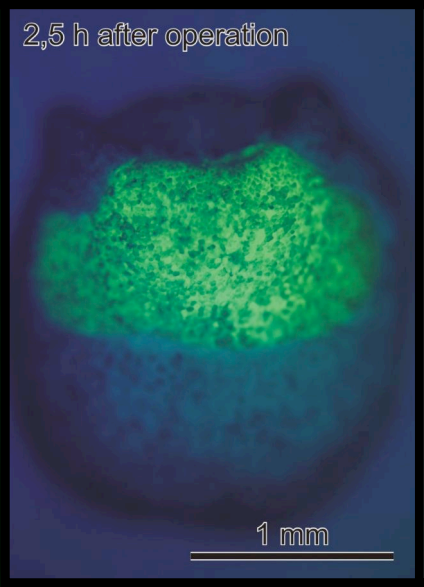
Tooth = **ENDODERM** + **NEURAL CREST** → **ECTODERM** + **NEURAL CREST**

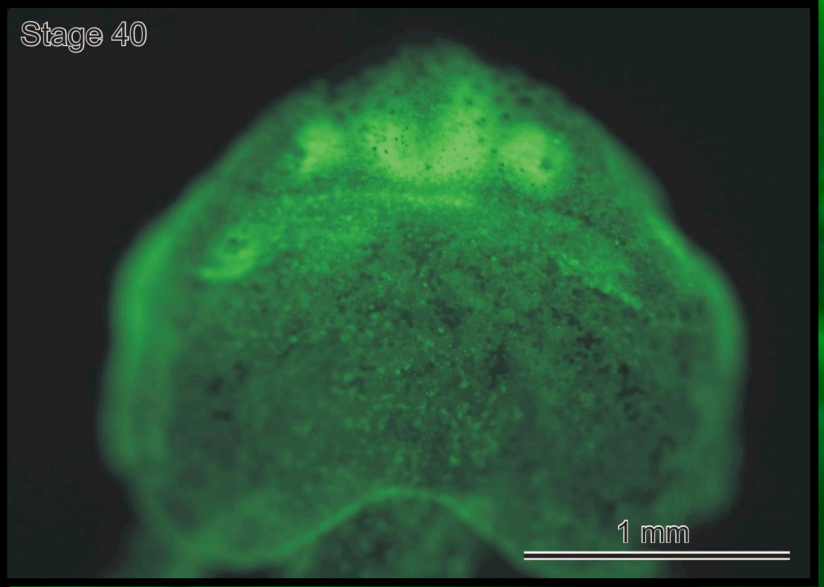
- (Smith & Johansson, 2003): …teeth may have evolved independently, several times, through a mechanism of convergent evolution.
- (Tucker & Sharpe, 2004): …diversity of dentitions might have been explained by combinatorial derivation of teeth from both external (ECT), as well as internal (END) denticles and teeth.

GFP axolotl embryos:
tracing the lineage of tracing cell lineages

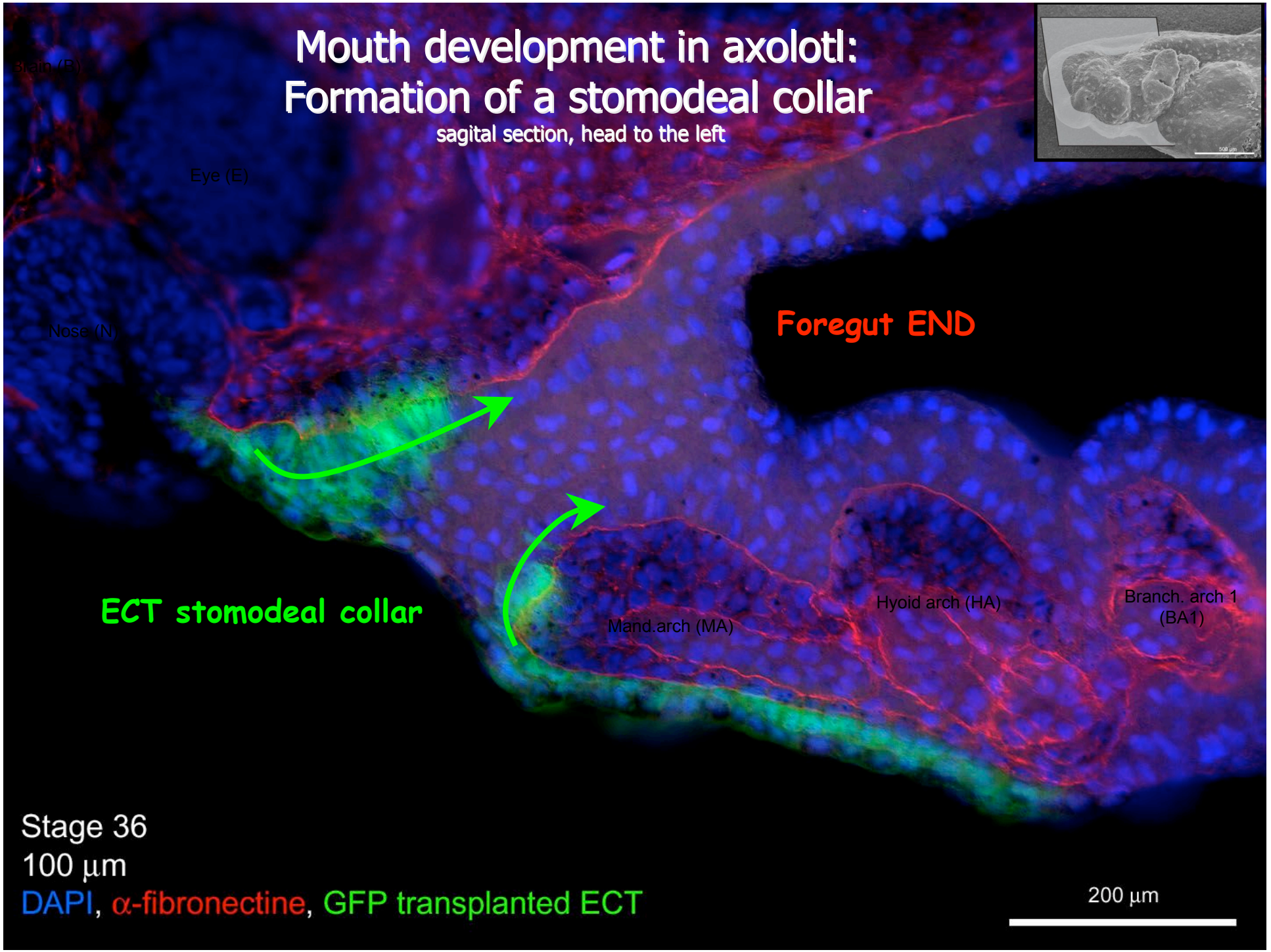


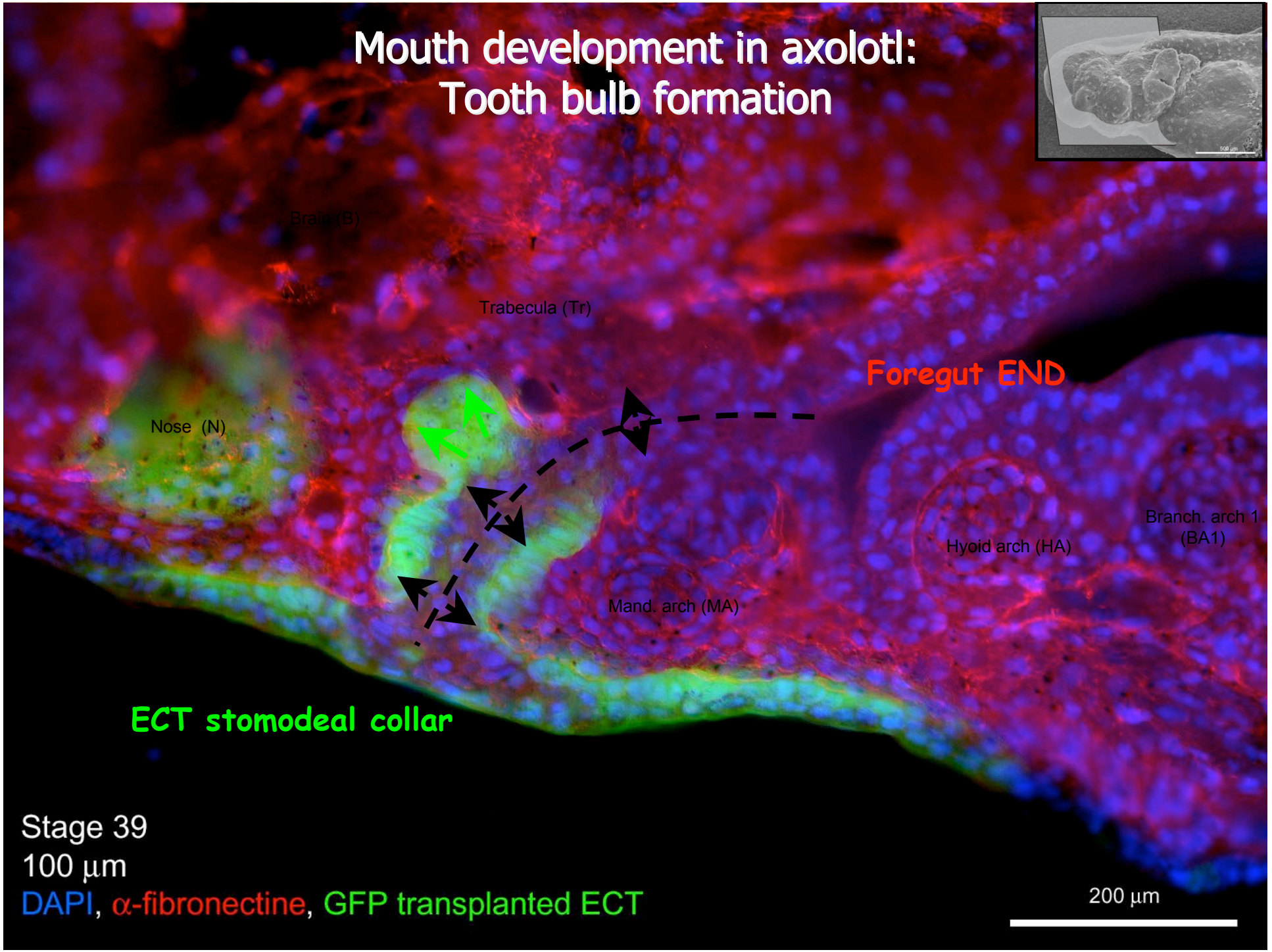
Transplantation of
entire prospective oral ECT area

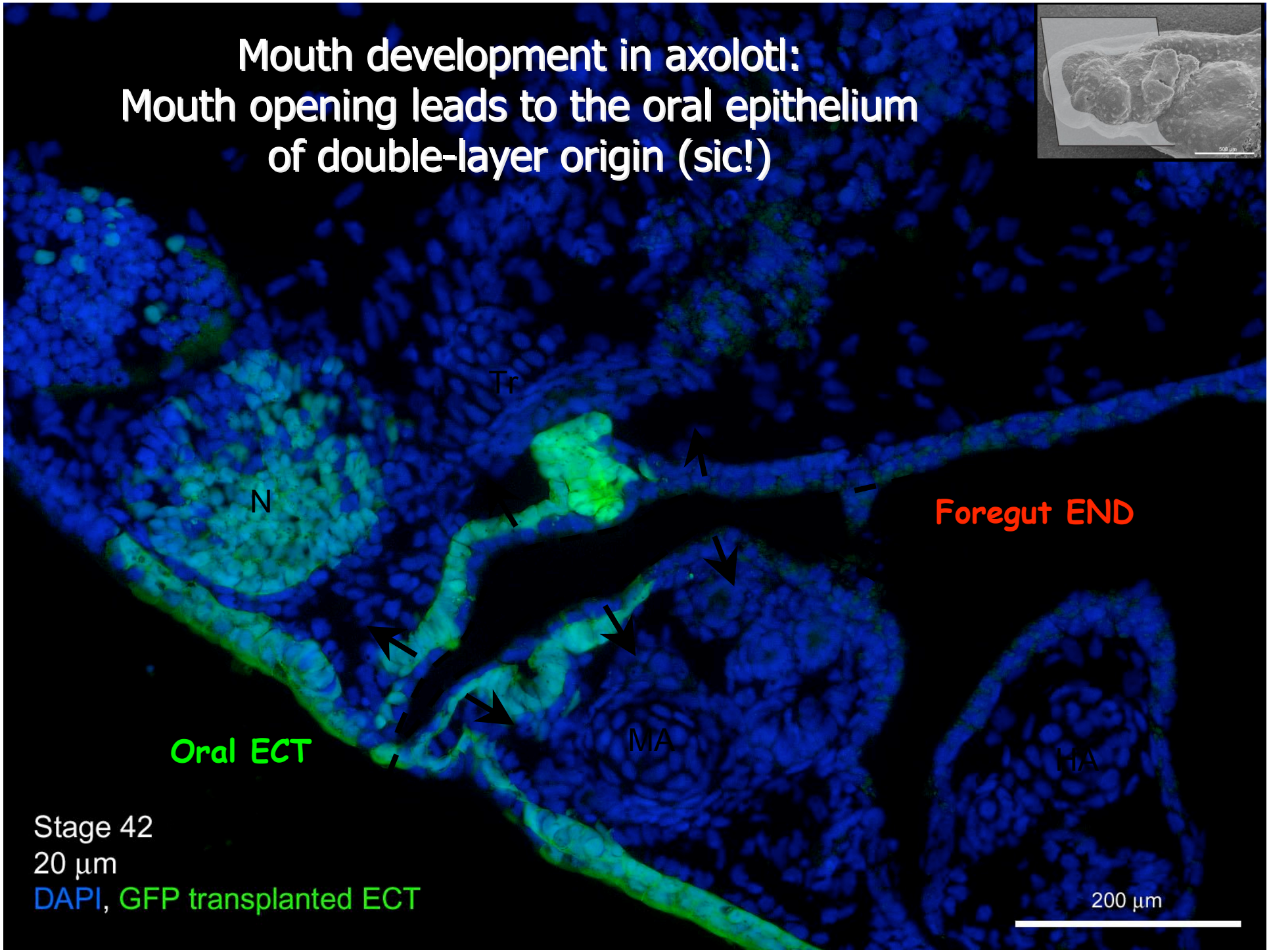


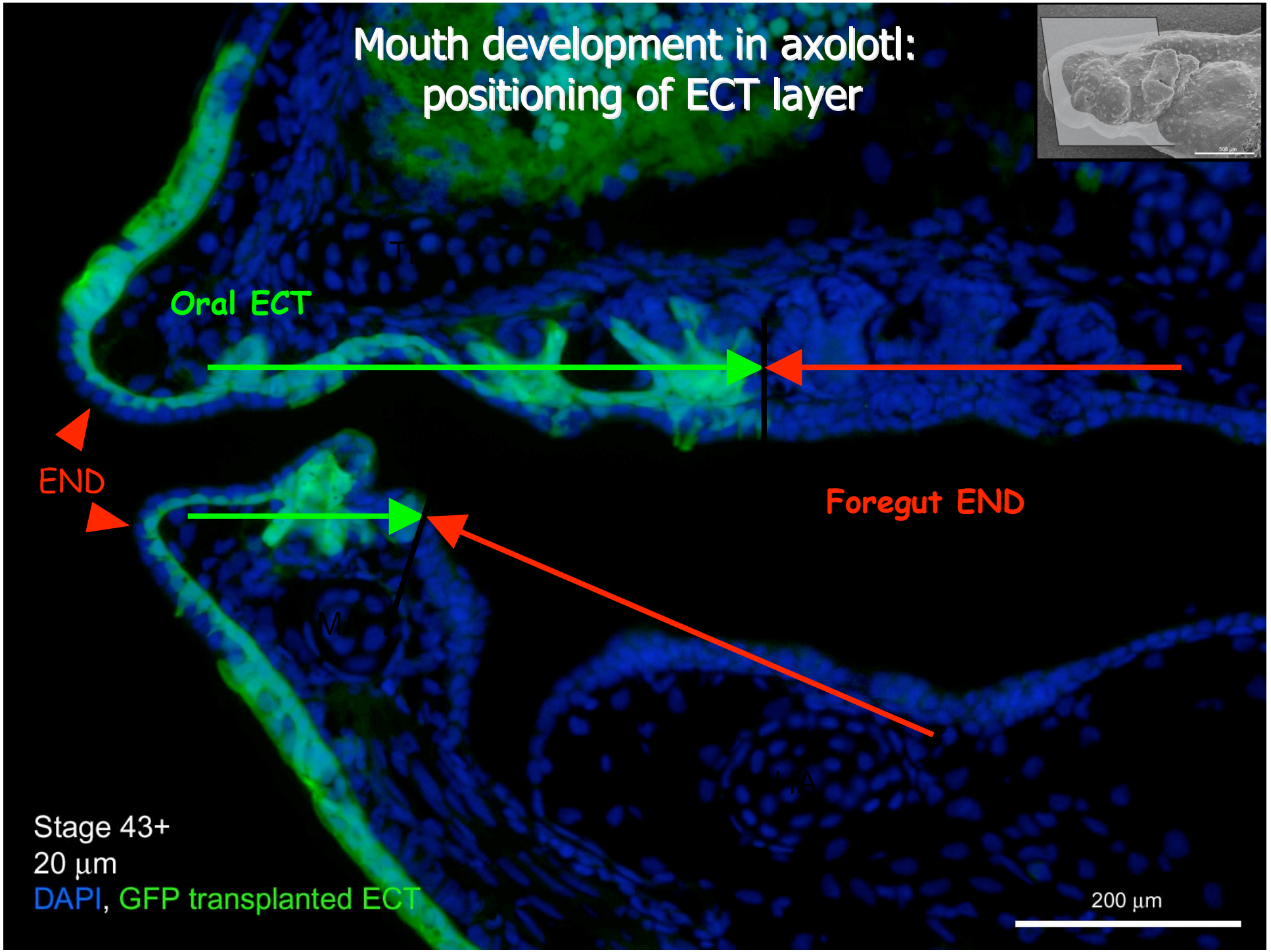


GFP axolotls: developed in **Elly Tanaka lab** (MPI-CBG Dresden; Sobkow et al. DB 290 (2006)

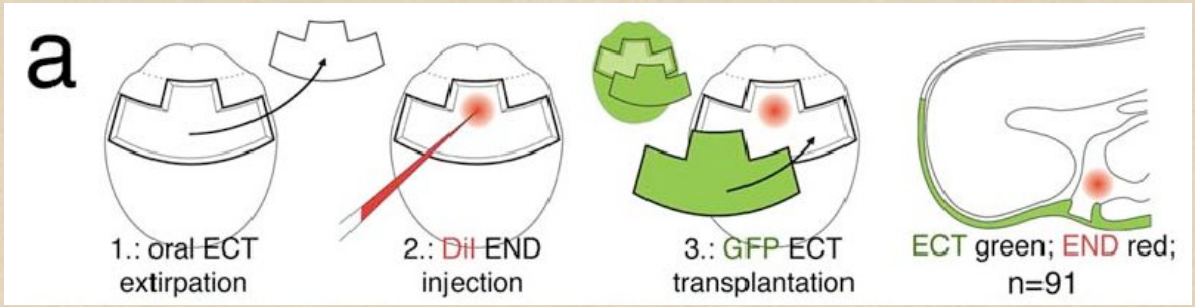

Mouth development in axolotl:
Formation of a stomodeal collar
sagital section, head to the left
Brain (B)
Eye (E)
Nose (N)
Foregut END
ECT stomodeal collar
Mand.arch (MA)
Hyoid arch (HA)
Branch. arch 1 (BA1)
Stage 36
100 µm
DAPI, α-fibronectine, GFP transplanted ECT
200 µm

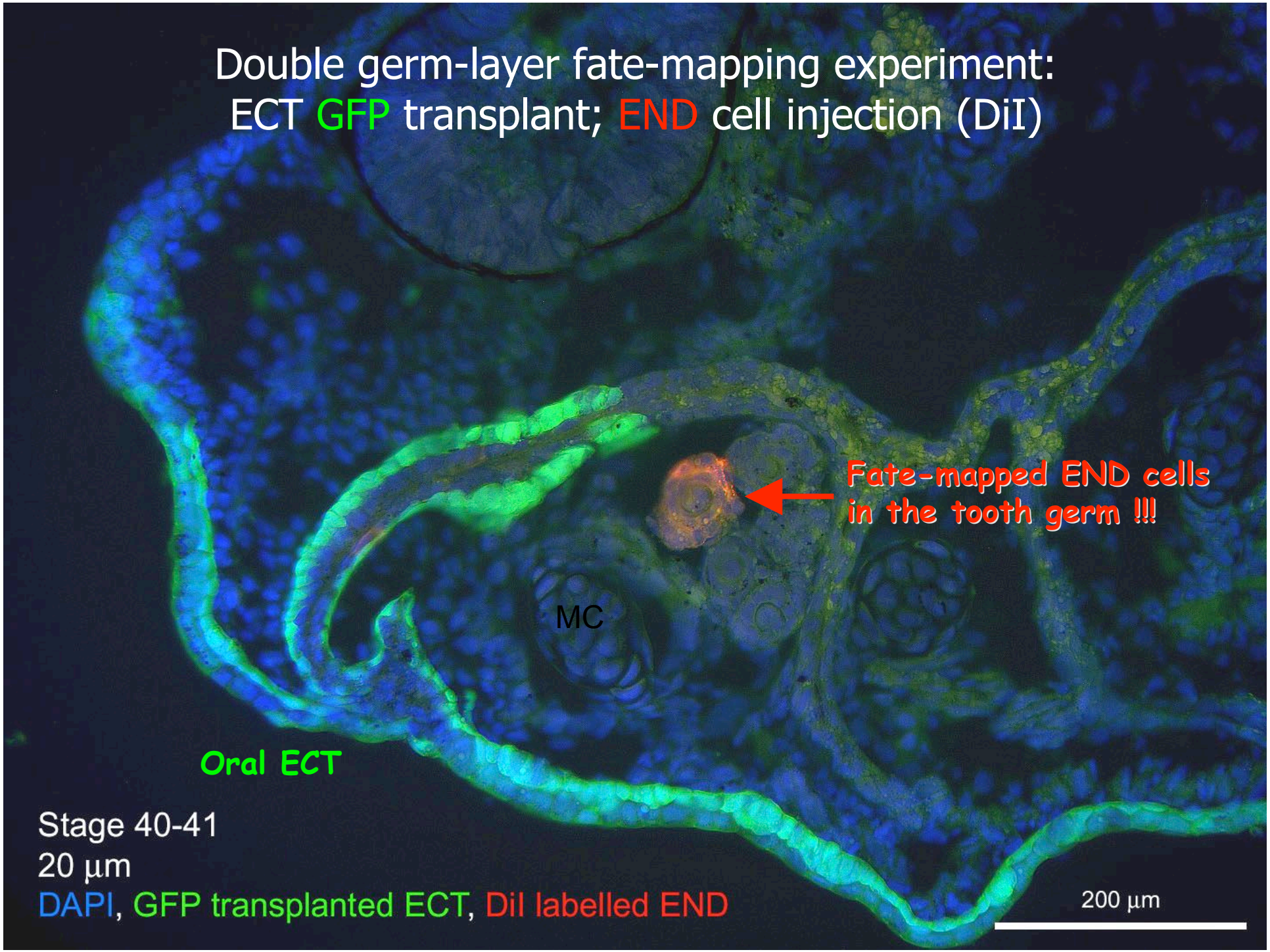

Mouth development in axolotl:
Tooth bulb formation
Brain (B)
Trabecula (Tr)
Foregut END
Nose (N)
Hyoid arch (HA)
Branch. arch 1
(BA1)
Mand. arch (MA)
ECT stomodeal collar
Stage 39
100 µm
DAPI, α-fibronectine, GFP transplanted ECT
200 µm

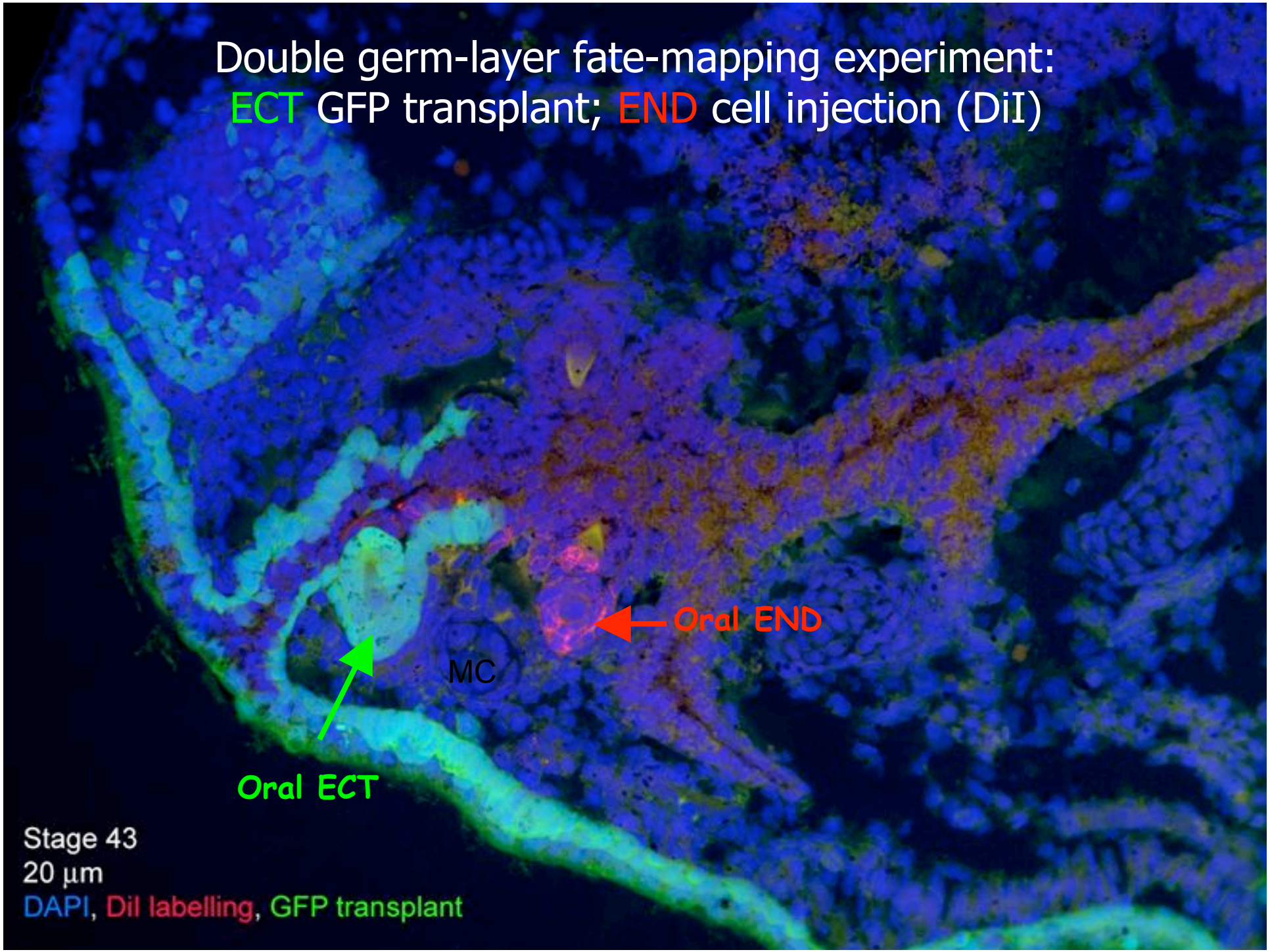

Mouth development in axolotl:
Mouth opening leads to the oral epithelium
of double-layer origin (sic!)
Tr
N
Foregut END
Oral ECT
MA
HA
Stage 42
20 µm
DAPI, GFP transplanted ECT
200 µm

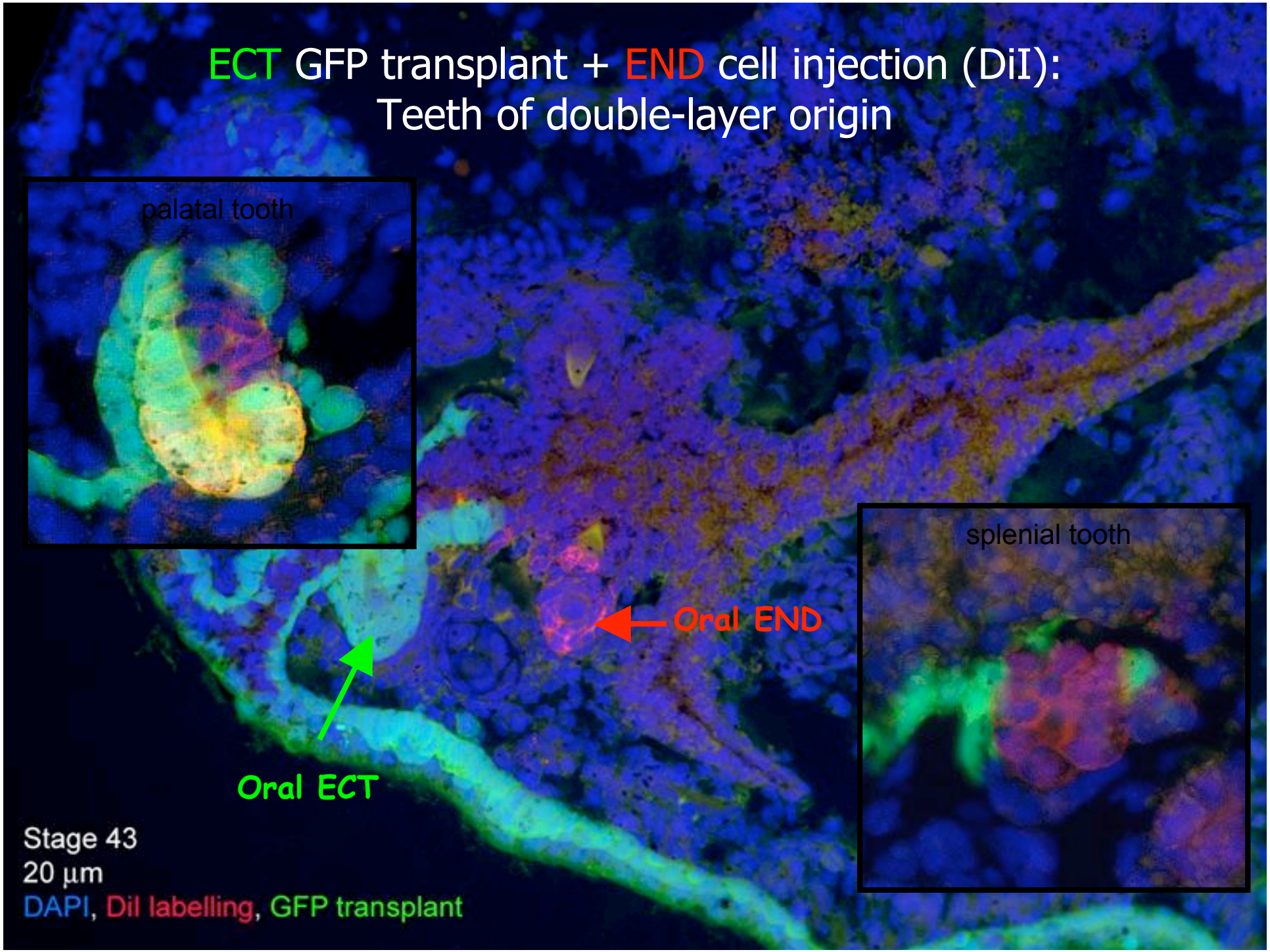

Mouth development in axolotl:
positioning of ECT layer
T1
Oral ECT
END
Foregut END
M
HA
Stage 43+
20 µm
DAPI, GFP transplanted ECT
200 µm

Double germ-layer fate-mapping experiment: GFP transplant marks ECT & cell injection (DiI) END

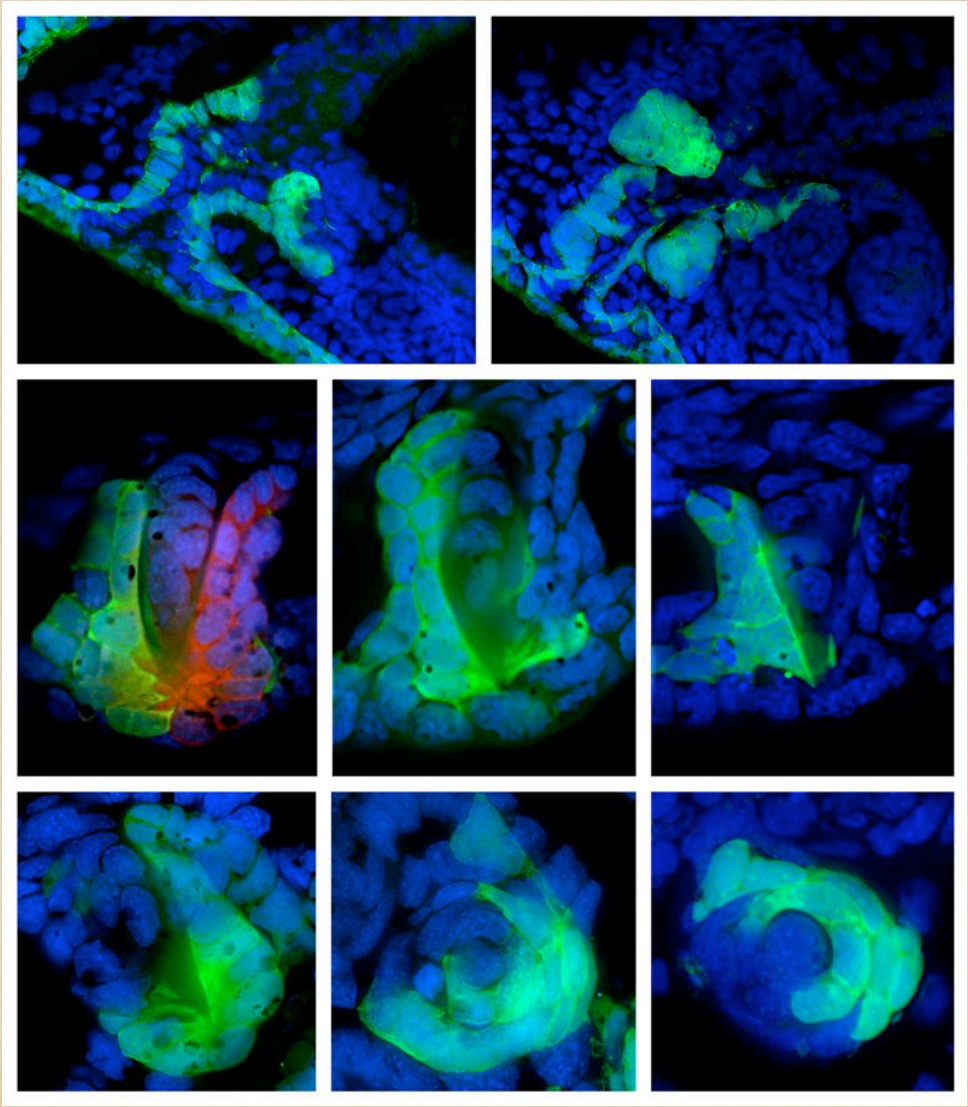



Double germ-layer fate-mapping experiment:
ECT GFP transplant; END cell injection (DiI)
Fate-mapped END cells
in the tooth germ !!!
MC
Oral ECT
Stage 40-41
20 µm
DAPI, GFP transplanted ECT, DiI labelled END
200 µm

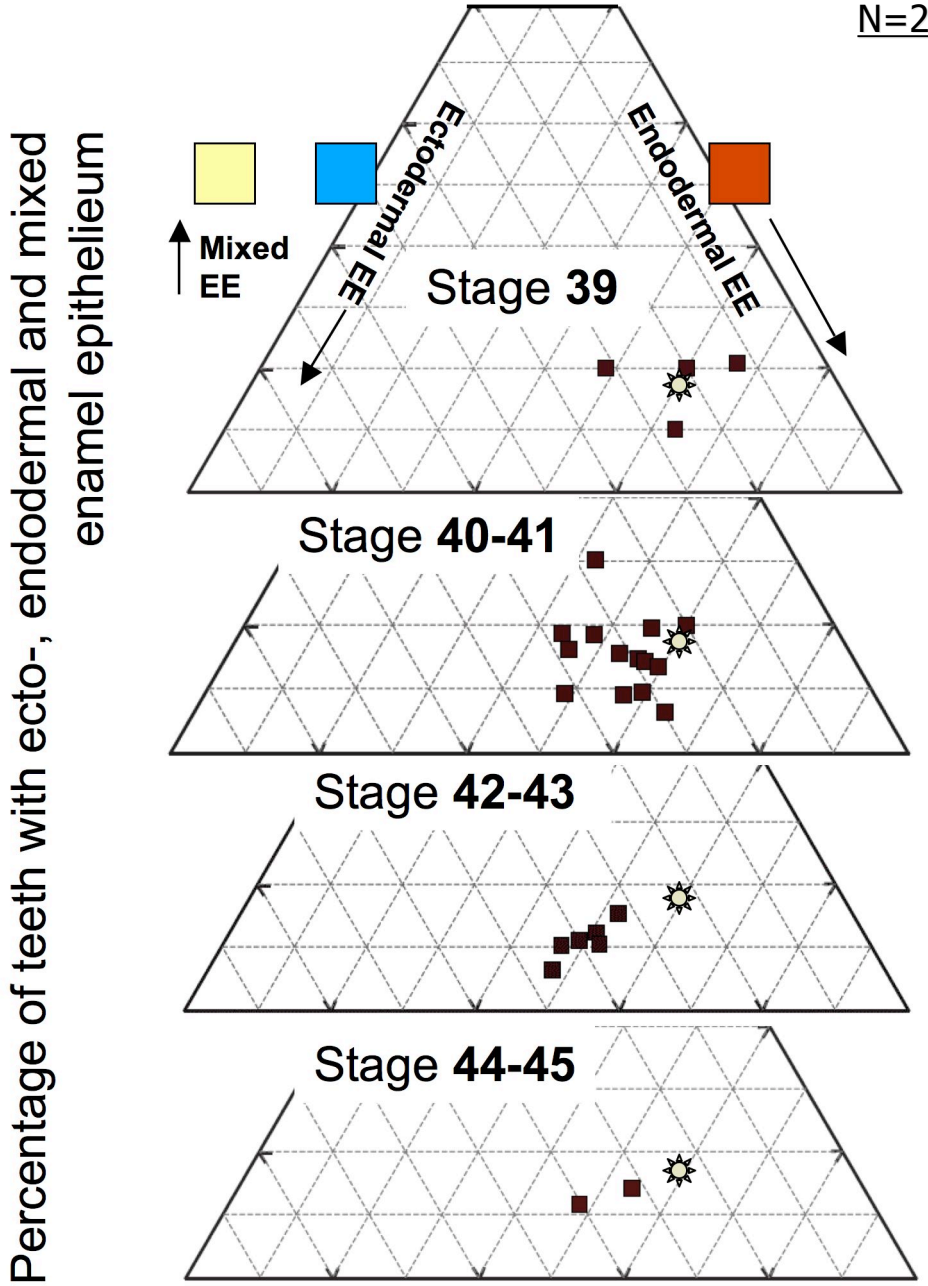

Double germ-layer fate-mapping experiment:
ECT GFP transplant; END cell injection (DiI)
Oral END
MC
Oral ECT
Stage 43
20 µm
DAPI, DiI labelling, GFP transplant

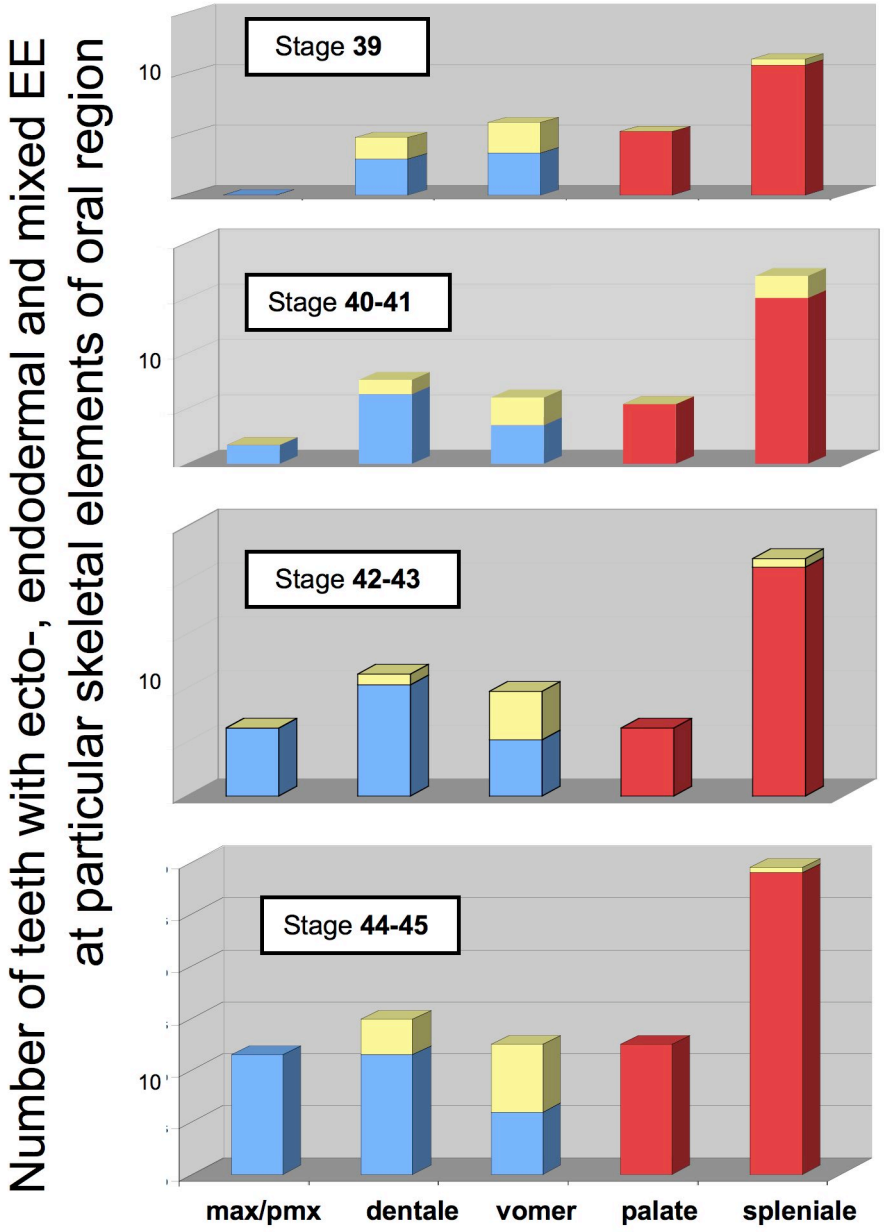

ECT GFP transplant + END cell injection (DiI):
Teeth of double-layer origin
palatal tooth
splenial tooth
Oral END
Oral ECT
Stage 43
20 µm
DAPI, DiI labelling, GFP transplant

ECT GFP transplant + END cell injection (DiI): Teeth of double-layer origin

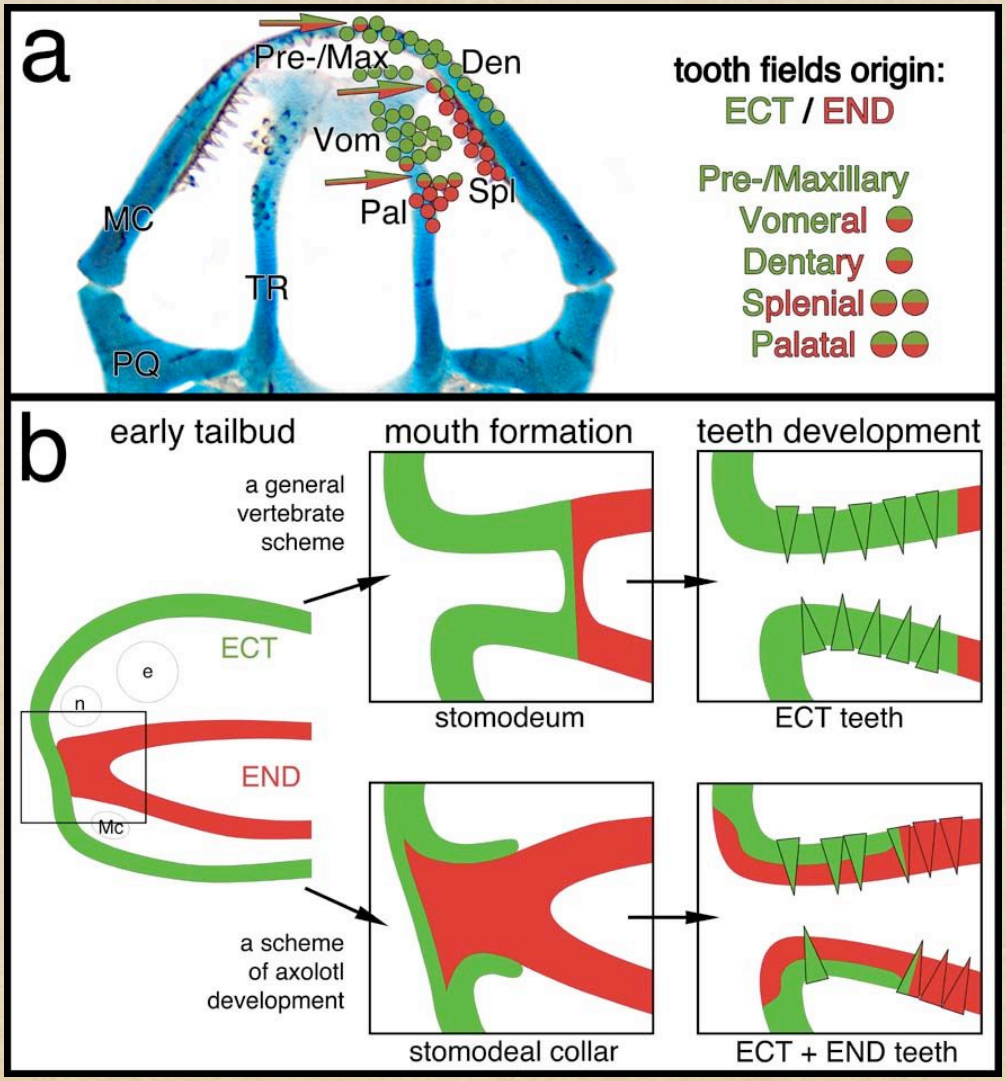


N=26; 1137 teeth; 374 ECT; 598 END; 155 mixed ECT/END



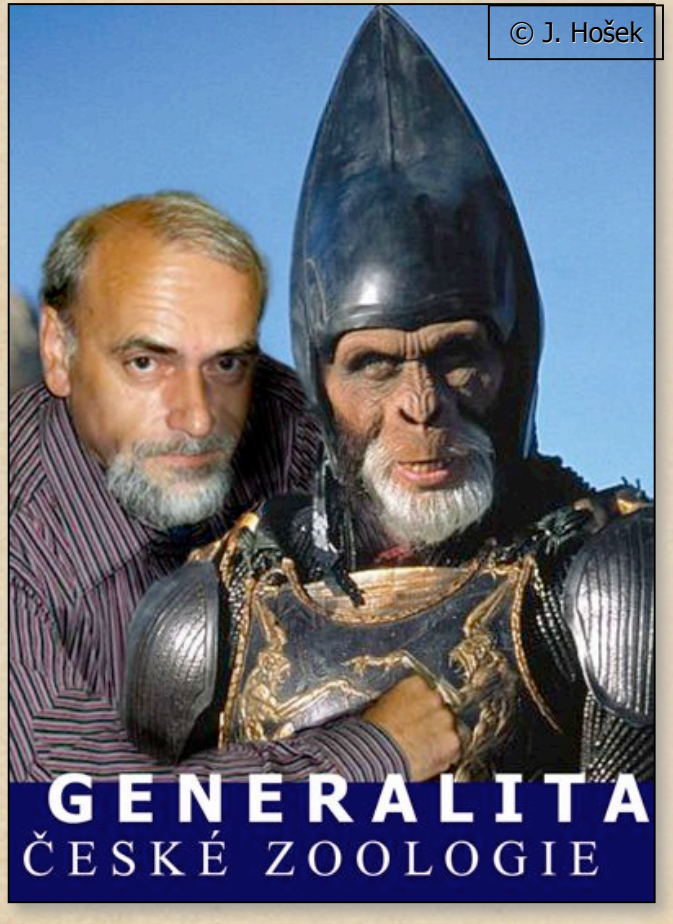


Germ layer origin of tooth enamel epithelia in the Mexican axolotl



Vl. Soukup (dipl. práce):

Prostorová dynamika ekto- a entodermu během faryngogeneze ve vztahu k zubním základům



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