

Supplementary Information

A microfluidic platform with cell-scale precise temperature control for simultaneous investigation of the osmotic responses of multiple oocytes

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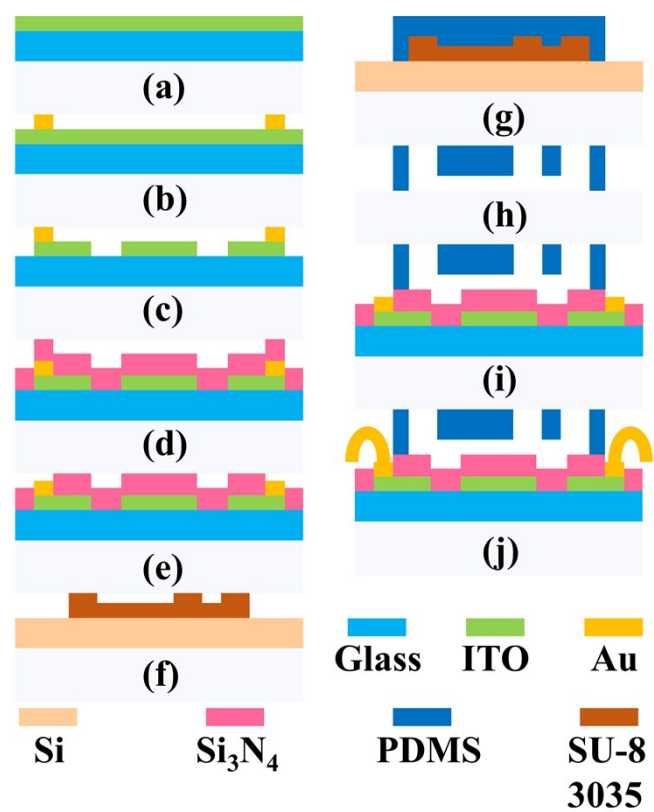
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17 **Movie Caption**

18 **Movie S1** shows the volume excursion of four oocytes during media switch from the
19 isotonic solution to the 1.5 M EG solution at 25 °C at ten time speed.

21 Supplementary Figures



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23 **Fig. S1** Fabrication of device: step-by-step description of the processes of fabrication

24 and assembly of the microheater/microsensor and the microchannel.

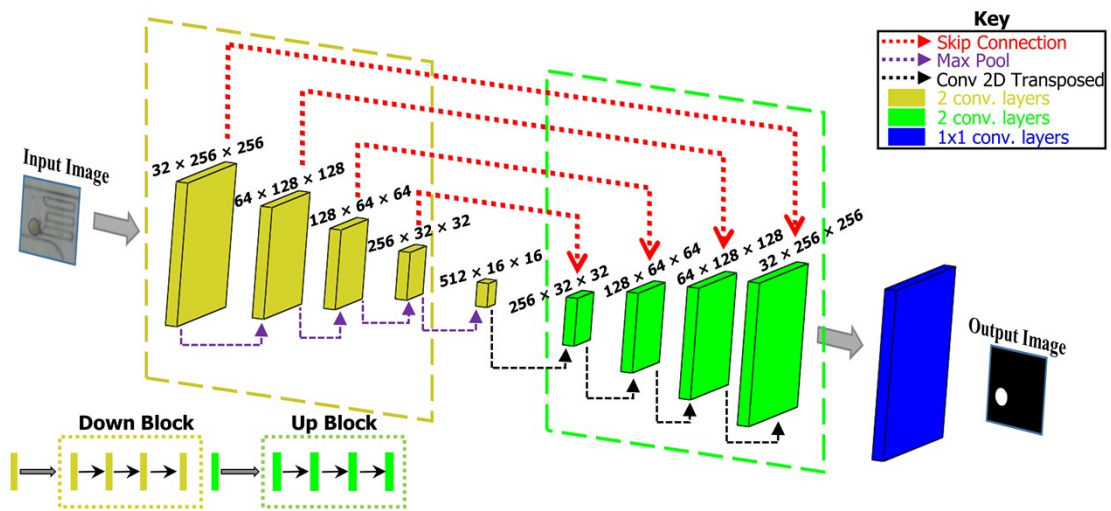


Fig. S2 Neural network architecture for cell image segmentation.¹

29 Supplementary Tables

30 **Table S1** Details description of trainable parameters of the neural network
 31 architecture.

Layer Identity	Filter Size	Filter Number	Remark
Conv 1_1	3×3	32	Down pooling phase
Conv 1_2	3×3	32	
Pooling 21	-	-	
Conv 2_1	3×3	64	
Conv 2_2	3×3	64	
Pooling 31	-	-	
Conv3_1	3×3	128	
Conv 3_2	3×3	128	
Pooling 41	-	-	
Conv 4_1	3×3	256	
Conv 4_2	3×3	256	
Pooling 51	-	-	
Conv 5_1	3×3	512	
Conv 5_2	3×3	512	
Conv2DTranspose 61	2×2	256	Up pooling phase
Conv 6_2	3×3	256	
Conv 71	3×3	256	
Conv2DTranspose 71	2×2	128	
Conv 7_2	3×3	128	
Conv 81	3×3	128	
Conv2DTranspose 81	2×2	64	
Conv 8_1	3×3	64	
Conv 8_2	3×3	64	
Conv2DTranspose 91	2×2	32	
Conv 9_1	3×3	32	
Conv 9_2	3×3	32	
Conv 101_1	1×1	1	

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34 **Table S2** The precision, recall and intersection over union (IoU) (means $\pm$ standard
 35 deviation) on the validation and test sets.

	Precision	Recall	IoU
Validation set	0.9897 ± 0.0078	0.9912 ± 0.0080	0.9811 ± 0.0112
Test set	0.9895 ± 0.0088	0.9899 ± 0.0153	0.9797 ± 0.0187

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38 **Table S3** Temperature-dependent mouse oocyte membrane permeability coefficients.

No.	CPA	L_p ($\mu\text{m atm}^{-1} \text{min}^{-1}$)	P_s ($\mu\text{m s}^{-1}$)	T ($^{\circ}\text{C}$)	Refs.
1	EG	0.09 ± 0.04	0.01 ± 0.01	4	Present
2	PG	0.11 ± 0.02	0.02 ± 0.01		
3	EG	0.23 ± 0.06	0.04 ± 0.01	15	
4	PG	0.21 ± 0.05	0.08 ± 0.02		
5	EG	0.43 ± 0.11	0.15 ± 0.03	25	
6	PG	0.48 ± 0.18	0.32 ± 0.15		
7	EG	0.73 ± 0.14	0.52 ± 0.16	37	
8	PG	0.66 ± 0.12	1.01 ± 0.17		
9	EG	0.18 ± 0.03	0.03 ± 0.01	10	2
10	PG	0.15 ± 0.02	0.04 ± 0.01		
11	EG	0.51 ± 0.08	0.09 ± 0.02	20	
12	PG	0.36 ± 0.13	0.24 ± 0.13		
13	EG	0.91 ± 0.16	0.24 ± 0.05	30	
14	PG	0.53 ± 0.05	0.43 ± 0.12		
15	EG	0.24 ± 0.04	0.04 ± 0.01	15	3
16	PG	0.23 ± 0.04	0.09 ± 0.02		
17	EG	0.42 ± 0.06	0.10 ± 0.01	25	
18	PG	0.48 ± 0.13	0.28 ± 0.10		
19	EG	0.70 ± 0.03	-	25	4

41 **Table S4** The E_{Lp} , L_{pg} , E_{Ps} and P_{sg} of the mouse oocytes measured in EG and PG
 42 solutions osmotic shifts from 37 °C to 4 °C.

CPA	E_{Lp} (kJ mol ⁻¹)	L_{pg} (μm atm ⁻¹ min ⁻¹)	E_{Ps} (kJ mol ⁻¹)	P_{sg} (μm s ⁻¹)
EG	42.73	0.079	87.37	0.005
PG	41.02	0.083	87.04	0.010

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45 Reference

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