

Supplementary information files

Predicting the growth situation of *Pseudomonas aeruginosa* on agar plates and meat stuff using gas sensors

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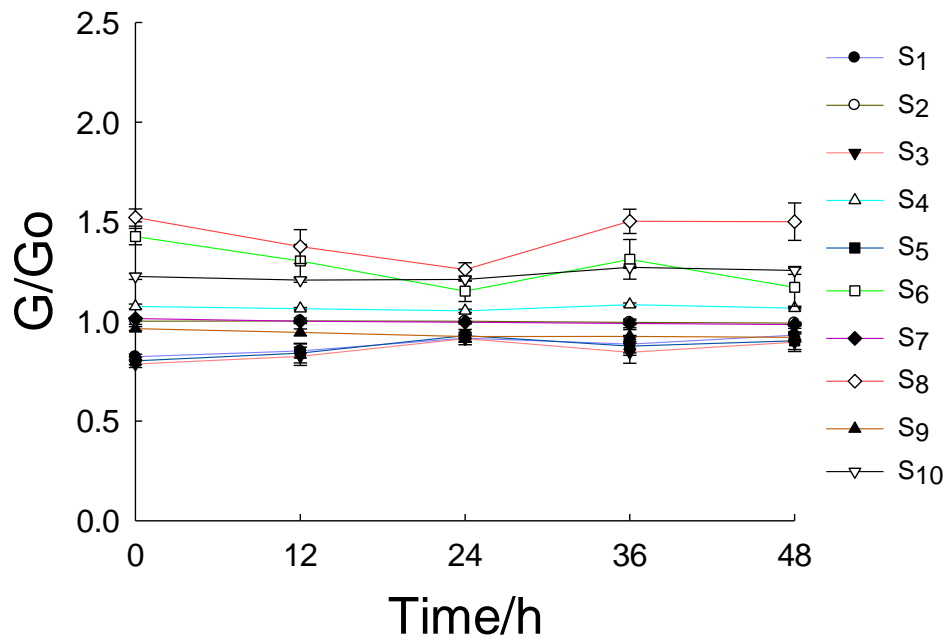
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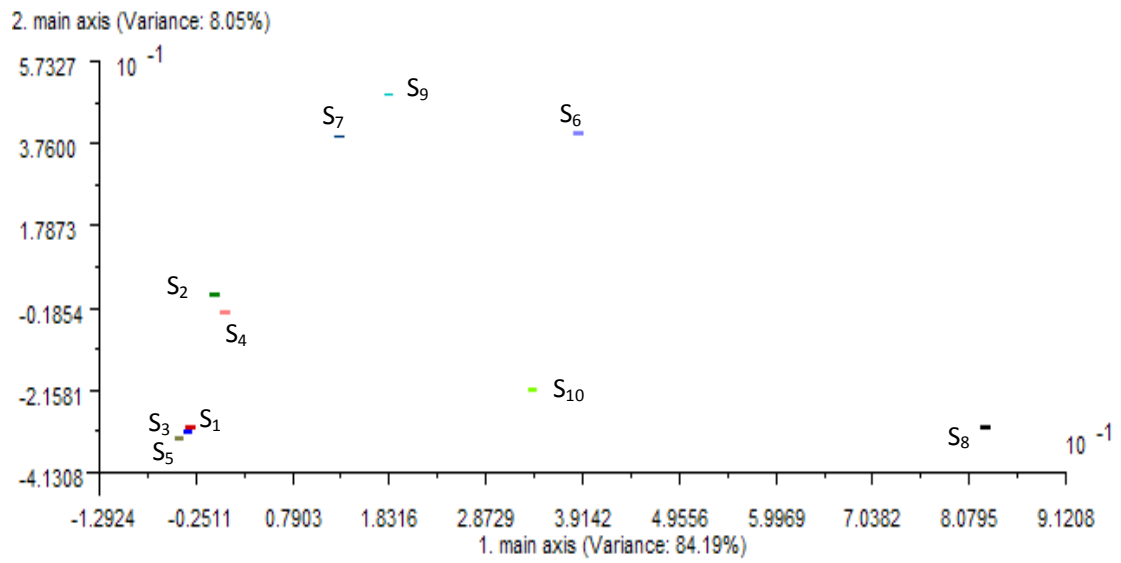
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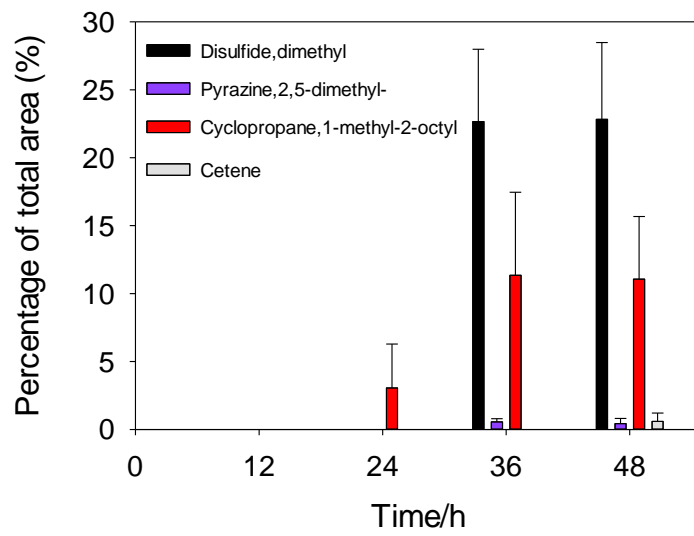
Supplementary Fig. A1. Average response values of 10 sensors of the control group for agar plates during the inoculation of 48 h

Refer to **Supplementary Fig. A1** at the point of '*Results/Growth simulation of P. aeruginosa on agar plate by gas sensors/ Gas sensors response.*



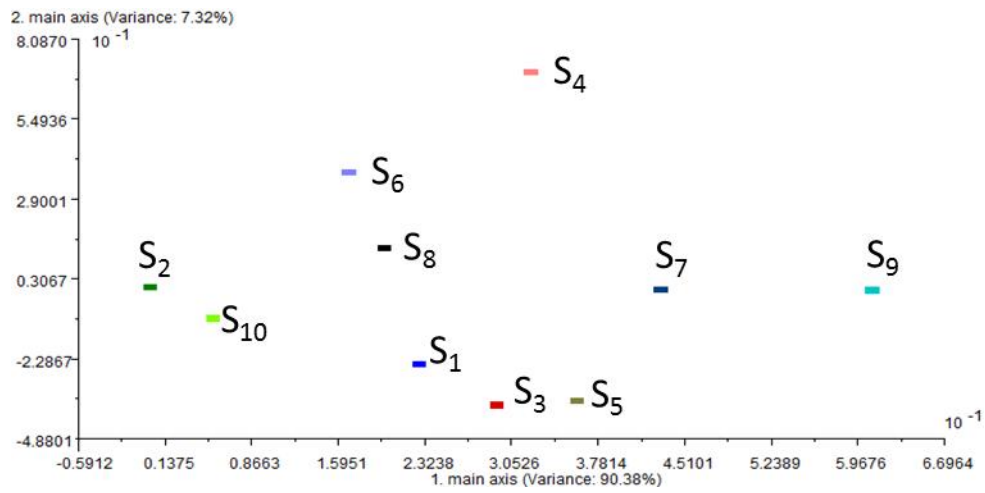
Supplementary Fig. A2. Loading analysis of *P. aeruginosa* on the agar plates

Refer to **Supplementary Fig. A2** at the point of 'Results/Growth simulation of *P. aeruginosa* on agar plate by gas sensors/ Sensors selection'.



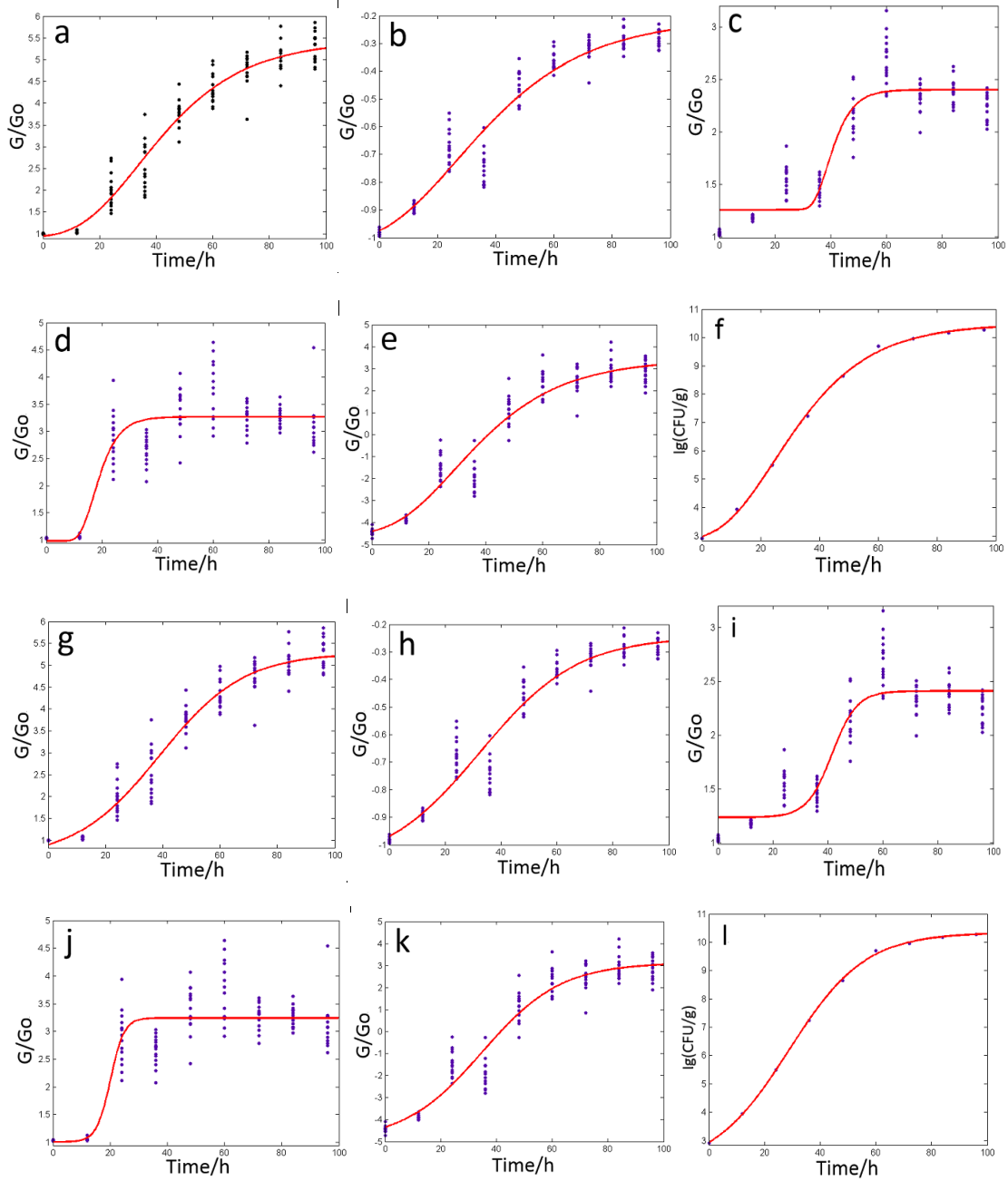
Supplementary Fig. A3. Some volatile compounds of agar plate samples inoculated with *P. aeruginosa* during 48 h of incubation.

Refer to **Supplementary Fig. A3** at 'HS-SPME/GC-MS analysis'.



Supplementary Fig. A4. Loading analysis of *P. aeruginosa* in fresh pork at 20 °C

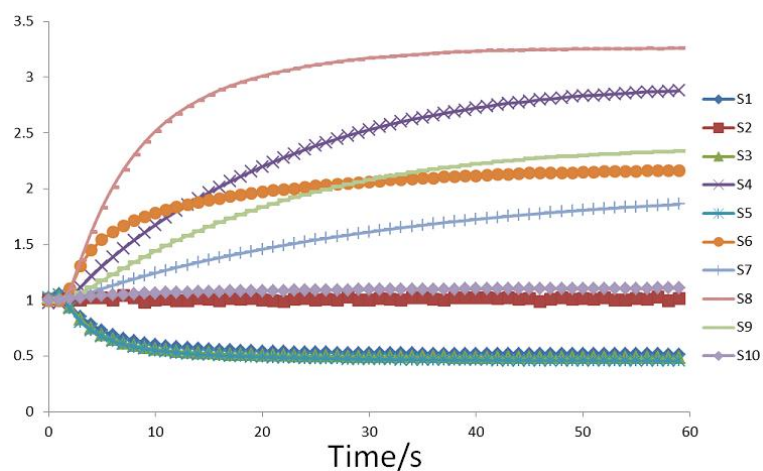
Refer to **Supplementary Fig. A4** at the point of 'Results/ Growth simulation of *P. aeruginosa* inoculated in fresh pork by gas sensors/ Sensor selection for growth simulation of *P. aeruginosa* in fresh pork stored at 20 °C'.



Supplementary Fig. A5. Fitting the growth curve of for *P. aeruginosa* in fresh pork stored at 20°C

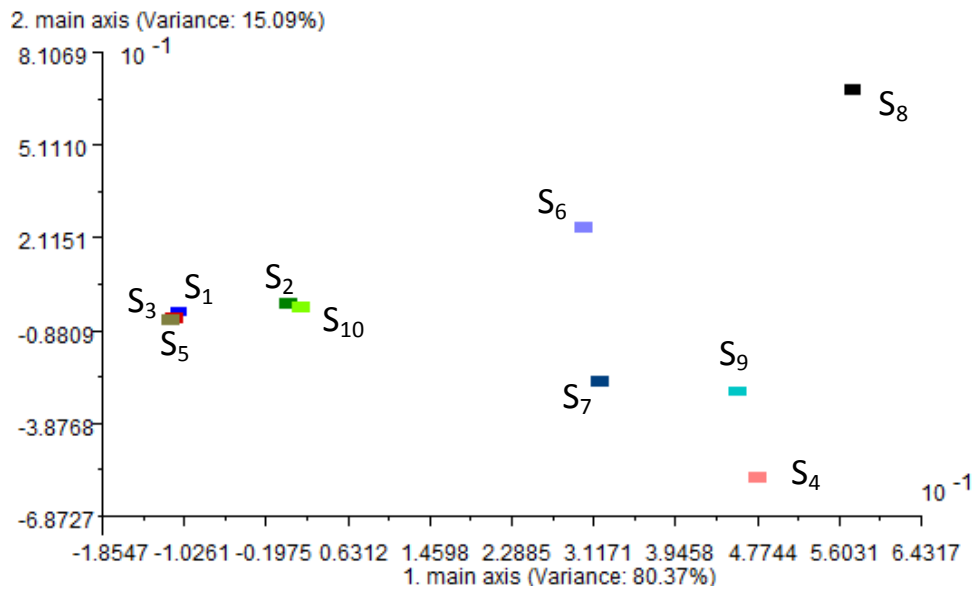
(a: S_9 , Gompertz; b: S_5 , Gompertz; c: S_8 , Gompertz; d: S_4 , Gompertz; e: PC 1, Gompertz; f: $\lg(\text{CFU/g})$, Gompertz; g: S_9 , Logistic; h: S_5 , Logistic; i: S_8 , Logistic; j: S_4 , Logistic; k: PC 1, Logistic; l: $\lg(\text{CFU/g})$, Logistic)

Refer to **Supplementary Fig. A5** at the point of 'Results/ Growth simulation of *P. aeruginosa* inoculated in fresh pork by gas sensors/ Growth simulation of *P. aeruginosa* in fresh pork stored at 20 °C'.



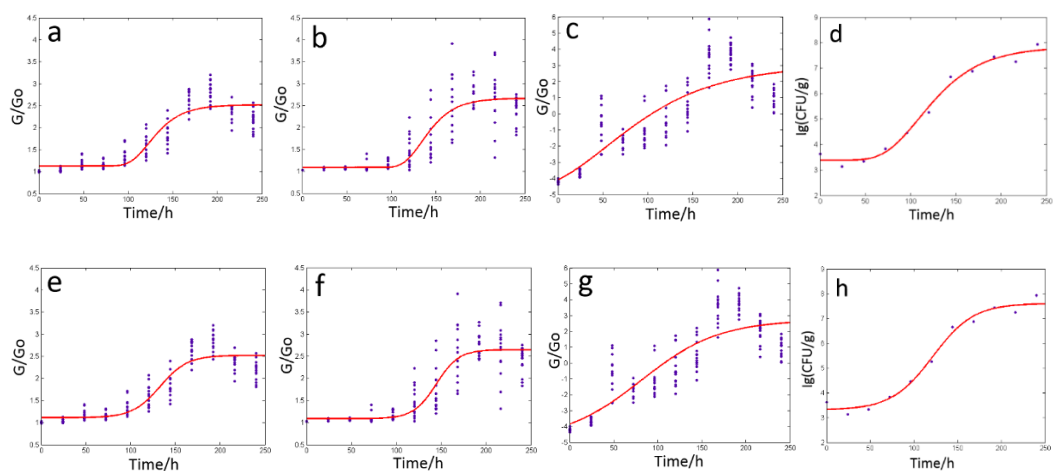
Supplementary Fig. A6. Response values of 10 sensors of a meat sample inoculated with *P. aeruginosa* at 168 h stored at 4 °C

Refer to **Supplementary Fig. A6** at the point of 'Results/ Growth simulation of *P. aeruginosa* inoculated in fresh pork by gas sensors/ Growth simulation of *P. aeruginosa* in fresh pork stored at 4 °C'.



Supplementary Fig. A7. Loading analysis of *P. aeruginosa* in fresh pork at 4 °C

Refer to **Supplementary Fig. A7** at the point of 'Results/ Growth simulation of *P. aeruginosa* inoculated in fresh pork by gas sensors/ Growth simulation of *P. aeruginosa* in fresh pork stored at 4 °C.



Supplementary Fig. A8. Fitting the growth curve of for *P. aeruginosa* in fresh pork stored at 4°C

(a: S_9 , Gompertz; b: S_4 , Gompertz; c: PC 1, Gompertz; d: $\lg(\text{CFU/g})$, Gompertz; e: S_9 , Logistic; f: S_4 , Logistic; g: PC 1, Logistic; h: $\lg(\text{CFU/g})$, Logistic)

Refer to **Supplementary Fig. A8** at the point of '*Results/ Growth simulation of *P. aeruginosa* inoculated in fresh pork by gas sensors/ Growth simulation of *P. aeruginosa* in fresh pork stored at 4 °C.*

Supplementary Table B1. Variance analysis of *P. aeruginosa* on agar plates

	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
0 h	0.798±	1.001±0.	0.744±0.	1.056±0	0.746±0	1.489±0	1.007±0	1.593±0	0.974±0	1.194±
	0.019d	018ab	025d	.007b	.029e	.065b	.006d	.08d	.023d	0.009c
12 h	0.936±	1.004±0.	0.941±0.	1.058±0	0.958±0	1.035±0	1.004±0	1.521±0	0.936±0	1.340±
	0.032a	016a	048a	.006b	.05a	.085c	.003d	.068d	.013d	0.022b
24 h	0.826±	1.008±0.	0.850±0.	1.056±0	0.850±0	1.511±0	1.303±0	2.339±0	1.354±0	1.701±
	0.030c	014a	022bc	.007b	.022c	.083b	.09a	.097c	.111a	0.053a
36 h	0.833±	0.997±0.	0.822±0.	1.061±0	0.811±0	1.710±0	1.190±0	2.558±0	1.193±0	1.703±
	0.069c	011ab	055c	.006b	.061d	.114a	.1b	.128b	.112b	0.056a
48 h	0.906±	0.992±0.	0.875±	1.079±0	0.879±0	1.649±0	1.064±0	2.708±0	1.060±0	1.737±
	0.034b	017b	0.028b	.026a	.029b	.159a	.049c	.239a	.044c	0.086a

Values (mean ± standard deviation) are statistically different in the same column with different letter.

Refer to **Supplementary Table B1** at the point of '*Results/Growth simulation of P. aeruginosa on agar plate by gas sensors/ Sensors selection*'.

Supplementary Table B2. Pearson correlation analysis of *P. aeruginosa* on agar plates.

	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀	IgCFU
S ₁	1										
S ₂	-0.043	1									
S ₃	0.909**	0.025	1								
S ₄	0.243*	-0.179	0.096	1							
S ₅	0.913**	0.035	0.995**	0.081	1						
S ₆	-0.55**	-0.22*	-0.624**	0.298**	-0.676**	1					
S ₇	-0.569**	0.077	-0.237*	-0.216*	-0.281**	0.411**	1				
S ₈	-0.165	-0.235*	-0.146	0.389**	-0.213*	0.842**	0.486**	1			
S ₉	-0.576**	0.066	-0.272*	-0.177	-0.319**	0.482**	0.991**	0.547**	1		
S ₁₀	-0.042	-0.159	0.081	0.322**	0.009	0.669**	0.597**	0.946**	0.639**	1	
IgCFU	0.151	-0.159	0.246*	0.333**	0.177	0.525**	0.470**	0.885**	0.499**	0.942**	1

*: significant difference ($P<0.05$); **: extremely significant difference ($P<0.01$)

Refer to **Supplementary Table B2** at the point of '*Results/Growth simulation of P. aeruginosa on agar plate by gas sensors/ Sensors selection*'.

Supplementary Table B3. Volatile compounds identified by HS-SPME/GC–MS analysis of the control group (agar plate samples) during the incubation of 48 h.

No	r_t^a	Volatile Compound	0 h	12 h	24 h	36 h	48 h
1	7.735	Oxime-,methoxy-phenyl-	+ ^b	- ^c	-	-	-
2	9.269	Benzaldehyde	+	+	-	+	-
3	10.766	Octanal	+	-	-	-	-
4	14.144	Nonanal	+	-	-	+	-
5	17.268	Decanal	+	+	+	-	+
6	22.23	Undecanal	+	-	-	-	-
7	13.988	Undecane	+	-	-	-	+
8	19.965	Tridecane	-	-	-	+	+
9	26.172	Pentadecane	+	+	-	+	+
10	22.975	Hexagecane	+	-	-	-	+

^a r_t : retention time; ^b +: detected; ^c -: not detected.

Refer to **Supplementary Table B3** at the point of '*Results/ Growth simulation of P. aeruginosa on agar plate by gas sensors/ HS-SPME/GC–MS analysis*'.

Supplementary Table B4. Variance analysis of *P. aeruginosa* in fresh pork at 20 °C

	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
0 h	0.982±0 .008a	1.007±0. 013ab	0.993±0 .01a	1.029±0. 007f	0.983±0 .01a	1.014±0 .013h	1.005±0 .006h	1.039±0 .019h	0.996±0 .009i	1.061±0. 005f
12 h	0.892±0 .027b	1±0.012 b	0.892±0 .026b	1.059±0. 023f	0.886±0 .031b	1.126±0 .021g	1.05±0. 077h	1.179±0 .024g	1.065±0 .108h	1.075±0. 003ef
24 h	0.707±0 .054c	1.005±0. 015ab	0.71±0. 059c	2.845±0. 433d	0.659±0 .067c	1.827±0 .18e	1.69±0. 293g	1.566±0 .124e	2.067±0 .394g	1.088±0. 006e
36 h	0.799±0 .038d	1.005±0. 016ab	0.804±0 .039d	2.603±0. 261e	0.75±0. 058d	1.636±0 .13f	1.944±0 .4f	1.449±0 .095f	2.501±0 .533f	1.024±0. 005g
48 h	0.587±0 .07e	1.008±0. 009ab	0.57±0. 083e	3.43±0.3 96b	0.465±0 .066e	2.671±0 .263a	2.961±0 .233e	2.159±0 .182d	3.818±0 .273e	1.14±0.0 13d
60 h	0.483±0 .035f	1.013±0. 011a	0.44±0. 037f	3.686±0. 534a	0.364±0 .033f	2.53±0. 307b	3.283±0 .242d	2.669±0 .232a	4.305±0 .37d	1.212±0. 045c
72 h	0.425±0 .042g	1.014±0. 012a	0.375±0 .046g	3.242±0. 241bc	0.325±0 .041g	2.178±0 .171c	3.582±0 .244c	2.297±0 .131c	4.72±0. 352c	1.37±0.0 63b
84 h	0.384±0 .032h	1.014±0. 016a	0.326±0 .035h	3.326±0. 221bc	0.287±0 .035h	2.158±0 .132c	3.762±0 .215b	2.407±0 .117b	5.03±0. 321b	1.482±0. 054a
96 h	0.365±0 .025h	1.012±0. 011a	0.312±0 .026h	3.142±0. 416c	0.283±0 .029h	1.996±0 .113d	4.038±0 .464a	2.245±0 .13c	5.255±0 .33a	1.463±0. 048a

Values (mean ± standard deviation) are statistically different in the same column with different letter.

Refer to **Supplementary Table B4** at the point of '*Results/ Growth simulation of P. aeruginosa inoculated in fresh pork by gas sensors/ Sensor selection for growth simulation of P. aeruginosa in fresh pork stored at 20 °C.*

Supplementary Table B5. Pearson correlation analysis of *P. aeruginosa* in fresh pork at 20 °C

	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀	lg(CFU)
S ₁	1										
S ₂	-0.284**	1									
S ₃	0.999**	-0.287**	1								
S ₄	-0.815**	0.276**	-0.801**	1							
S ₅	0.995**	-0.290**	0.993**	-0.846**	1						
S ₆	-0.760**	0.252**	-0.746**	0.931**	-0.809**	1					
S ₇	-0.964**	0.282**	-0.964**	0.816**	-0.965**	0.764**	1				
S ₈	-0.916**	0.303**	-0.916**	0.892**	-0.937**	0.897**	0.905**	1			
S ₉	-0.970**	0.294**	-0.969**	0.826**	-0.973**	0.782**	0.994**	0.917**	1		
S ₁₀	-0.866**	0.296**	-0.877**	0.533**	-0.831**	0.444**	0.848**	0.717**	0.849**	1	
lg(CFU)	-0.943**	0.282**	-0.941**	0.856**	-0.955**	0.806**	0.949**	0.916**	0.962**	0.768**	1

*: significant difference ($P<0.05$); **: extremely significant difference ($P<0.01$)

Refer to **Supplementary Table B5** at the point of 'Results/ Growth simulation of *P. aeruginosa* inoculated in fresh pork by gas sensors/ Sensor selection for growth simulation of *P. aeruginosa* in fresh pork stored at 20 °C'.

Supplementary Table B6. Variance analysis of *P. aeruginosa* in fresh pork at 4 °C

	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀
0h	0.978± 0.007a	1.002±0 .009ab	0.989± 0.008a	1.029±0 .003e	0.978± 0.01a	1.024±0 .013f	1.005± 0.006h	1.052±0 .017f	0.996±0 .011i	1.062±0 .005e
24 h	0.921± 0.021b	1.001±0 .014ab	0.926± 0.024b	1.065±0 .042e	0.919± 0.022b	1.091±0 .032f	1.039± 0.042h	1.132±0 .038f	1.052±0 .062hi	1.073±0 .005d
48 h	0.635± 0.074e	1.004±0 .011ab	0.587± 0.083e	1.066±0 .02e	0.563± 0.092e	1.86±0. 309bc	1.056± 0.034h	2.305±0 .493c	1.157±0 .106h	1.058±0 .014e
72 h	0.727± 0.035c	0.998±0 .016b	0.678± 0.043c	1.091±0 .102e	0.646± 0.05c	1.509±0 .1e	1.075± 0.056h	1.963±0 .253e	1.159±0 .069h	1.056±0 .009e
96 h	0.69±0. 057d	1.003±0 .015ab	0.638± 0.06d	1.155±0 .098e	0.596± 0.063d	1.605±0 .222de	1.2±0.1 03g	2.321±0 .489c	1.366±0 .167g	1.052±0 .01ef
12 0h	0.646± 0.053e	1.005±0 .012ab	0.6±0.0 58e	1.418±0 .319d	0.561± 0.059e	1.63±0. 26de	1.395± 0.183f	2.254±0 .518cd	1.598±0 .228f	1.041±0 .011g
14 4h	0.588± 0.046f	1.001±0 .014ab	0.542± 0.052f	1.691±0 .443c	0.503± 0.055f	1.848±0 .278bc	1.578± 0.251e	2.804±0 .667b	1.853±0 .235e	1.044±0 .013fg
16 8h	0.481± 0.027h	1.002±0 .009ab	0.451± 0.03h	2.52±0. 579b	0.424± 0.031h	2.222±0 .293a	2.174± 0.211b	3.459±0 .573a	2.675±0 .221b	1.113±0 .032b
19 2h	0.465± 0.022h	1.007±0 .015ab	0.439± 0.025h	2.859±0 .35a	0.415± 0.026h	2.246±0 .225a	2.321± 0.21a	3.351±0 .559a	2.888±0 .224a	1.131±0 .027a
21 6h	0.535± 0.027g	1.009±0 .012a	0.505± 0.029g	2.654±0 .564ab	0.469± 0.031g	1.903±0 .163b	1.988± 0.16c	2.286±0 .249cd	2.421±0 .188c	1.091±0 .014c
24 0h	0.571± 0.04h	1.003±0 .011ab	0.542± 0.043f	2.461±0 .298b	0.505± 0.046f	1.734±0 .113cd	1.858± 0.224d	2.004±0 .17de	2.241±0 .264d	1.075±0 .015d

Values (mean ± standard deviation) are statistically different in the same column with different letter.

Refer to **Supplementary Table B6** at the point of '*Results/ Growth simulation of P. aeruginosa inoculated in fresh pork by gas sensors/ Growth simulation of P. aeruginosa in fresh pork stored at 4 °C.*

Supplementary Table B7. Pearson correlation analysis of *P. aeruginosa* in fresh pork at 4 °C

	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀	lg(CFU)
S ₁	1										
S ₂	-0.109	1									
S ₃	0.996**	-0.101	1								
S ₄	-0.712**	0.144*	-0.663**	1							
S ₅	0.991**	-0.099	0.999**	-0.648**	1						
S ₆	-0.920**	0.096	-0.916**	0.706**	-0.908**	1					
S ₇	-0.814**	0.138*	-0.762**	0.849**	-0.747**	0.719**	1				
S ₈	-0.858**	0.066	-0.861**	0.586**	-0.855**	0.958**	0.661**	1			
S ₉	-0.850**	0.139*	-0.802**	0.866**	-0.787**	0.770**	0.993**	0.712**	1		
S ₁₀	-0.440**	0.089	-0.380**	0.742**	-0.349**	0.543**	0.662**	0.477**	0.675**	1	
lg(CFU)	-0.788**	0.110	-0.751**	0.848**	-0.748**	0.647**	0.879**	0.578**	0.896**	0.462**	1

*: significant difference ($P<0.05$); **: extremely significant difference ($P<0.01$)

Refer to **Supplementary Table B7** at the point of '*Results/ Growth simulation of P. aeruginosa inoculated in fresh pork by gas sensors/ Growth simulation of P. aeruginosa in fresh pork stored at 4 °C.*

Supplementary Table B8. Response material and sensitivity of 10 metal oxide sensors

Sensor	Response material	Sensitivity
S ₁	Sensitive to aromatic compounds	10ppm
S ₂	Sensitive to nitrogen oxides	NO ₂ ,1ppm
S ₃	Sensitive to ammonia and aromatic compounds	Benzene,10ppm
S ₄	Sensitive to hydrogen	H ₂ ,100ppb
S ₅	Sensitive to alkenes and aromatic compounds	Propane,1ppm
S ₆	Sensitive to methane broad range	CH ₃ ,100ppm
S ₇	Sensitive to sulphur compounds	H ₂ S,1ppm
S ₈	Sensitive to alcohols and partially aromatic compounds	CO,100ppm
S ₉	Sensitive to aromatics compounds and sulphur organic compounds	H ₂ S,1ppm
S ₁₀	Sensitive to alkane	CH ₃ ,100ppm

Refer to **Supplementary Table B8** at the point of '*Materials and methods/ Electronic nose trials*'.