



**Preparation and antibacterial activity  
evaluation of targeted PLGA Nano-agents for  
*Ralstonia solanacearum***

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# C O N T E N T S

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## Research Background



## Bacterial Wilt

- **The difficulty prevention and treatment**  
The disease is acute, spread rapidly, so far there is no effective prevention and treatment methods;
- **Widely distributed**  
It can infect more than **40 families** and more than **200 species** of plants and is distributed all over the world;
- **Circulation infection**  
It is one of the most harmful plant diseases in the world, and it is easy to form soil infestation source and cause **cyclic harm**.



## Research purpose

# A targeted PLGA nanomicrobial agent for bacterial wilt is urgently needed



### Environmental friendly

- Pesticides and their degradables are harmful to soil
- Bacteria develop drug resistance



### Accurate dosing

- The source of natural
- less dosage
- High efficacy

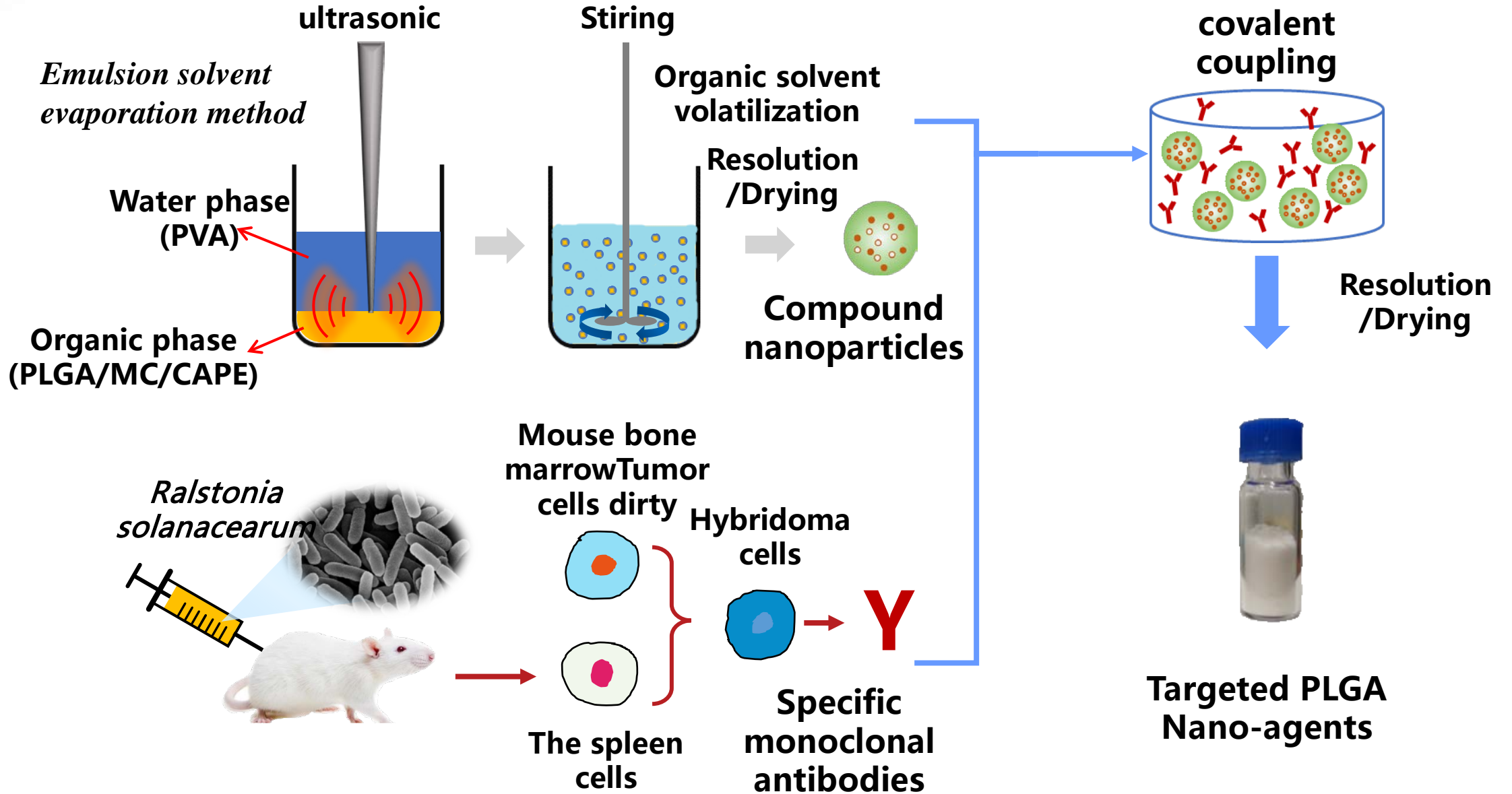


### Healthy

- Reduce the harm of pesticide residues to human body

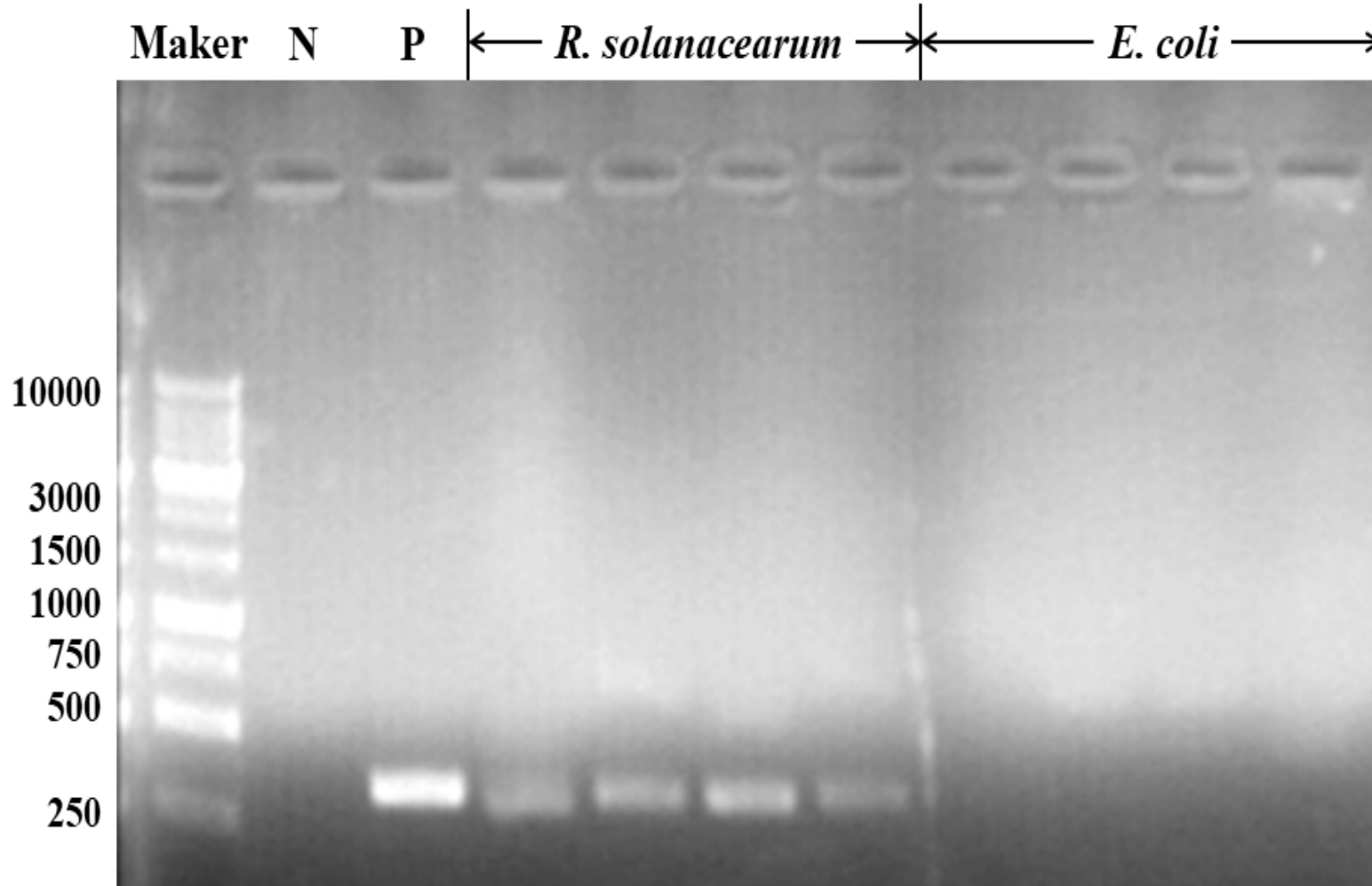


# Research contents





# Research results: Specific targeting of antibodies



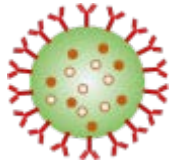
the antibody can be used to prepare a novel agent that specifically binds to *Ralstonia solanacearum*



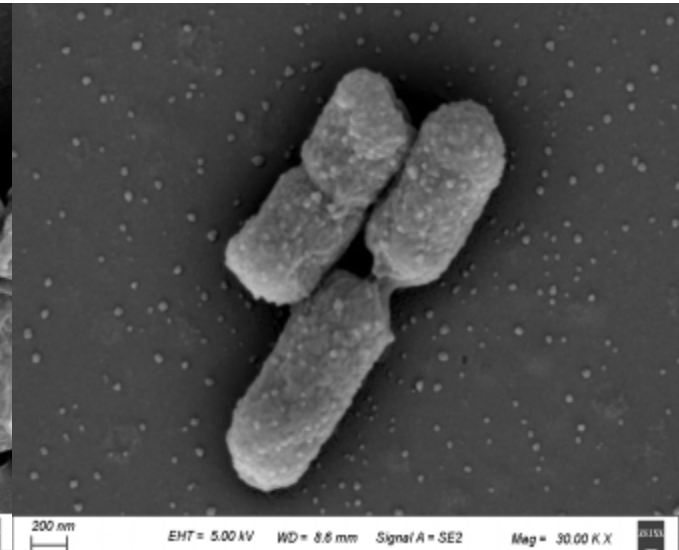
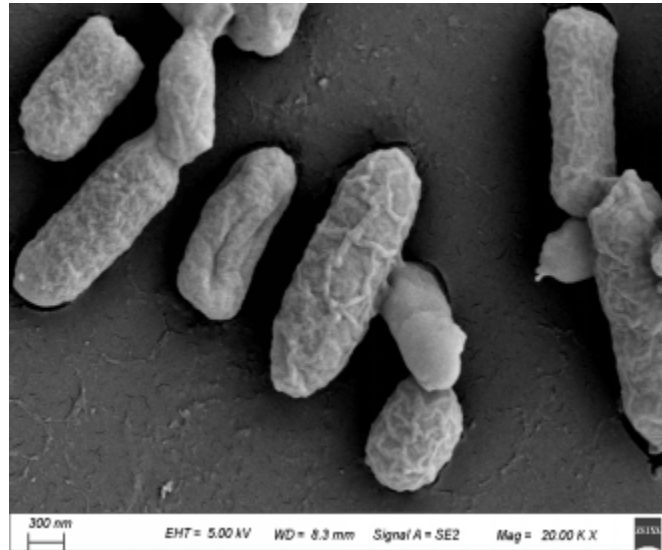
# Research results: Electron microscopy observation

The normal strain

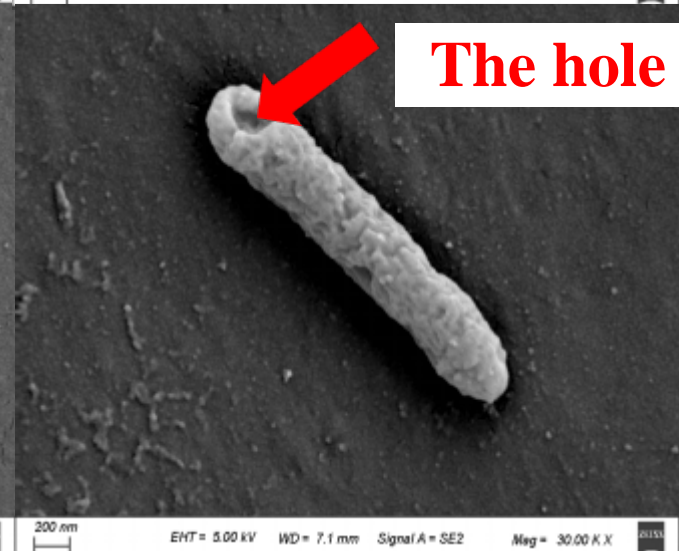
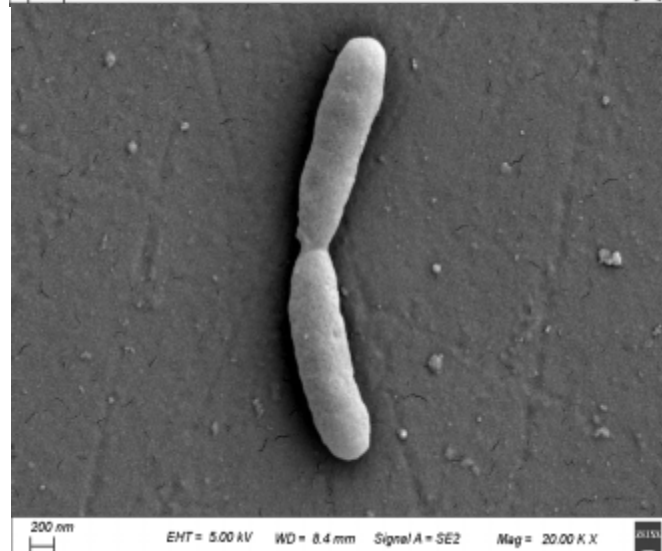
Targeted nano-agent treatment



*E. coli*

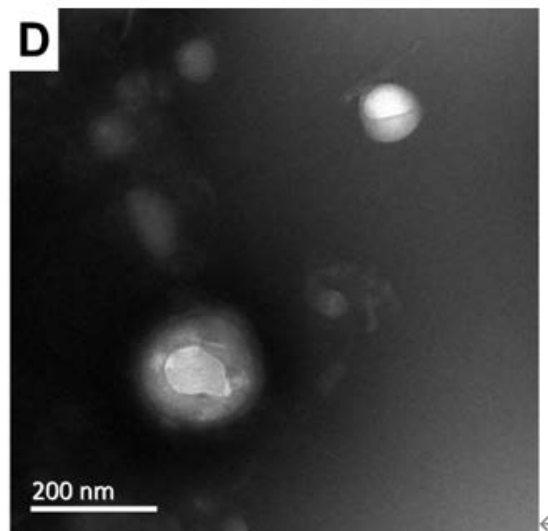
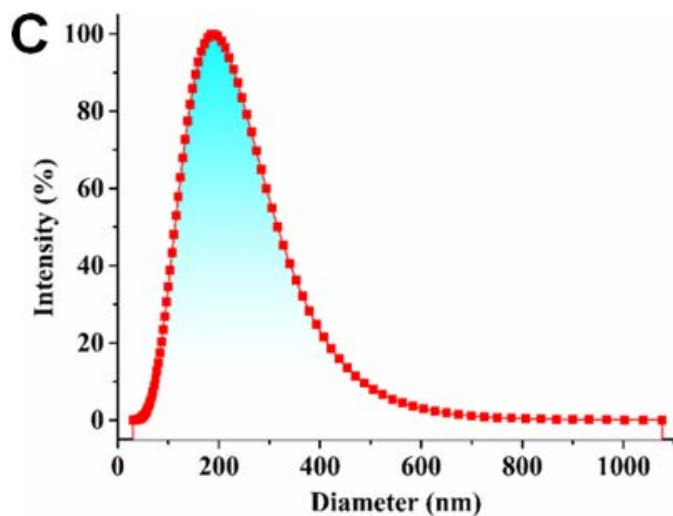
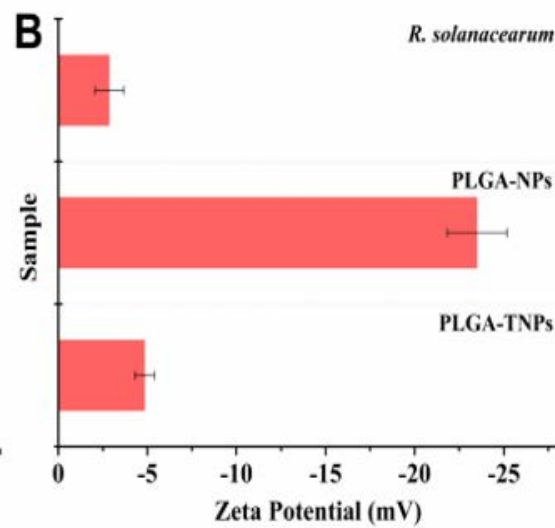
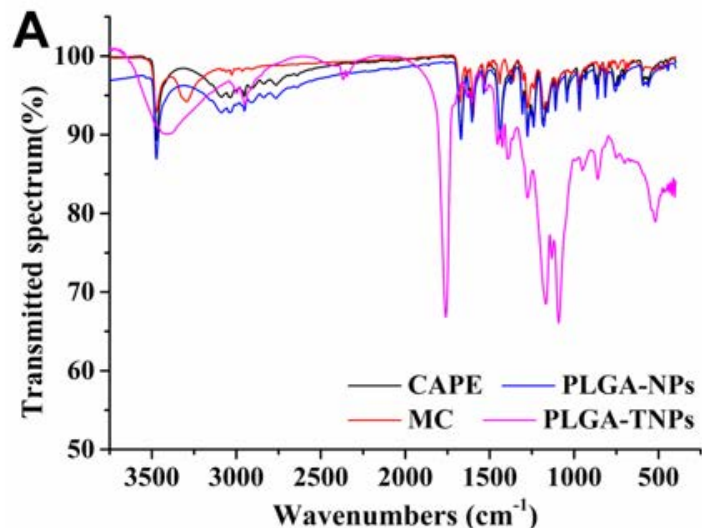


*Ralstonia solanacearum*





# Research results: Characterization of PLGA-TNPs



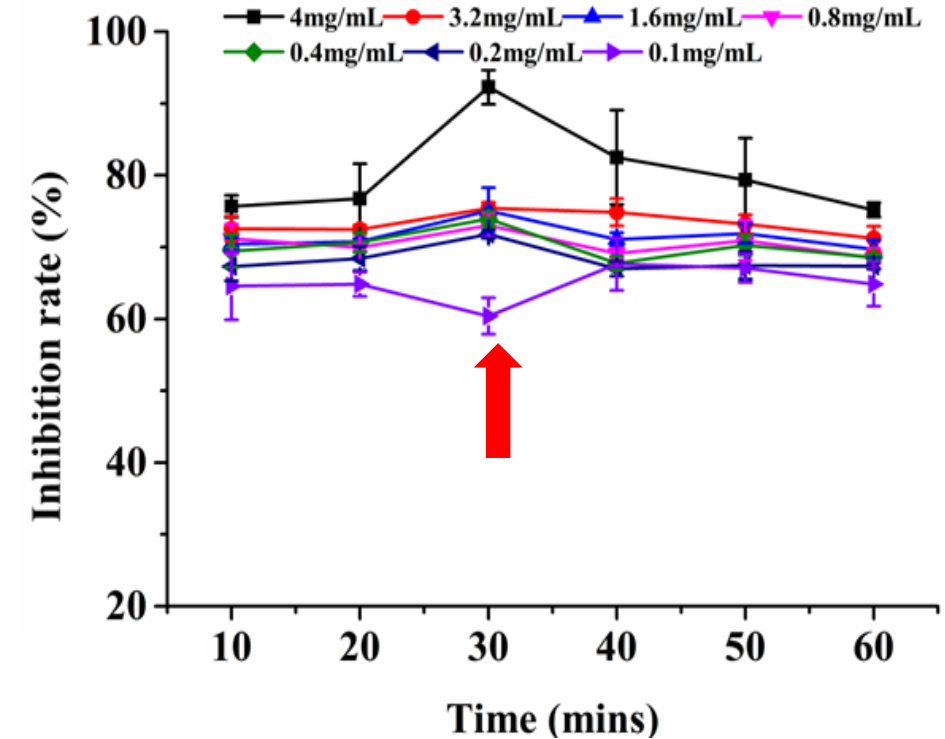
Use FT-IR (A), Zeta potential analysis (B), particle size distribution (C) and TEM (D) techniques to characterize the prepared PLGA-TNPs





# Research results: Different activation time

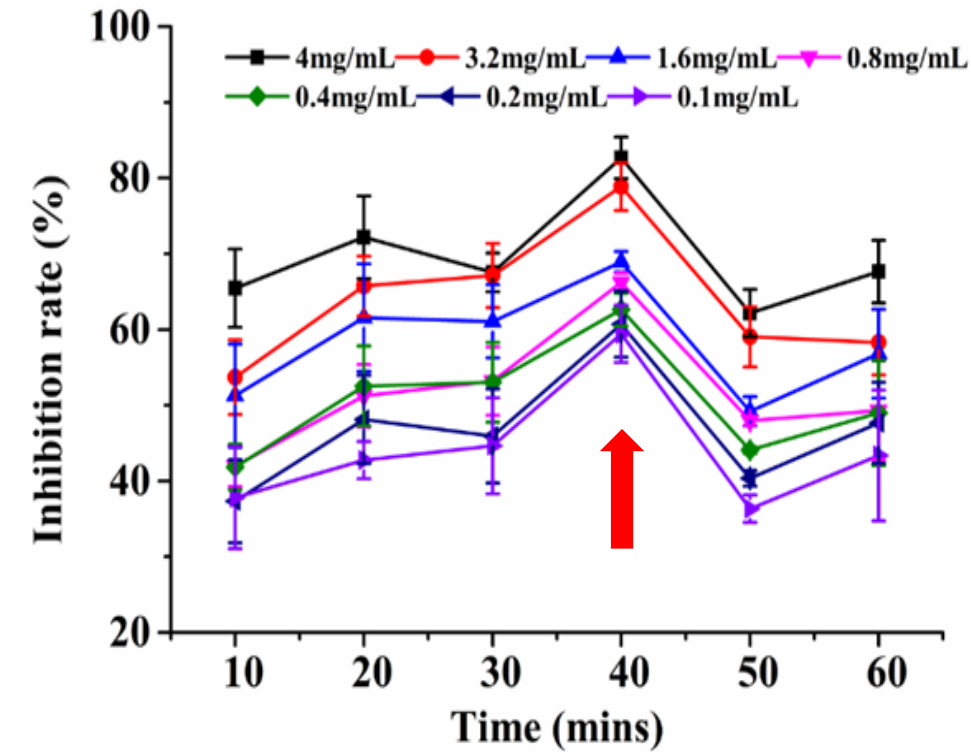
Concentration (mg/mL)	Activation time (mins)					
	10	20	30	40	50	60
4	75.66±1.54	76.76±4.85	92.26±2.37	82.48±6.57	79.37±5.79	75.18±0.99
3.2	72.57±1.72	72.44±0.61	75.39±0.82	74.84±1.88	73.20±1.31	71.20±1.70
1.6	70.40±0.92	70.77±0.45	75.04±3.23	71.06±0.91	71.88±1.35	69.71±1.27
0.8	71.15±2.05	69.92±0.42	73.02±1.71	69.11±0.75	70.93±2.77	68.47±1.38
0.4	69.44±2.24	70.63±1.34	73.91±1.03	67.76±0.97	70.24±1.37	68.56±0.36
0.2	67.29±1.99	68.41±1.71	71.77±0.56	66.97±1.01	67.45±1.93	67.35±0.45
0.1	64.57±4.70	64.84±1.68	60.40±2.53	67.64±3.66	67.07±1.97	64.84±3.10





# Research results: Different connection time

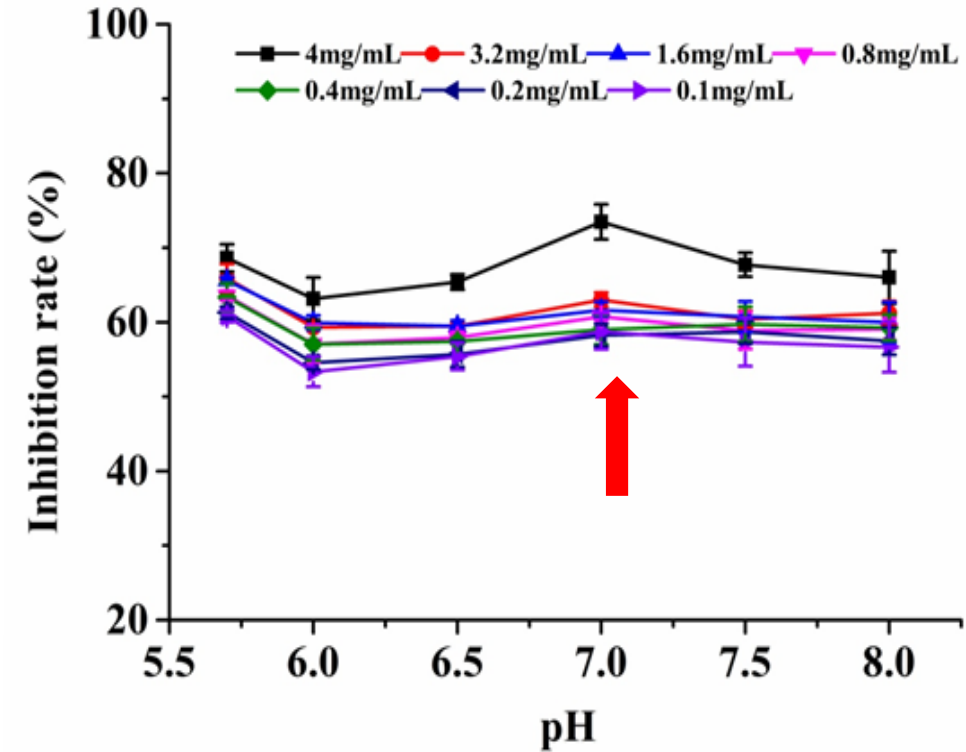
Concentration (mg/mL)	Connection time (min)					
	10	20	30	40	50	60
4	65.46±5.16	72.17±5.45	67.5±2.57	82.68±2.75	62.19±3.12	67.66±4.14
3.2	53.71±4.93	65.74±3.97	67.1±4.25	78.87±3.15	59.04±3.96	58.30±4.33
1.6	51.26±6.81	61.56±7.08	61.0±4.83	68.94±1.36	49.18±1.95	56.82±5.87
0.8	41.97±2.71	51.26±4.11	53.1±4.51	66.22±1.25	47.99±0.66	49.32±6.54
0.4	41.83±3.02	52.53±5.28	53.0±5.26	62.62±2.16	44.07±0.43	48.98±6.92
0.2	37.32±5.49	48.13±5.83	45.9±6.19	60.70±4.37	40.33±1.03	57.66±5.35
0.1	37.79±6.77	42.75±2.44	44.6±6.33	59.39±3.78	36.32±1.82	43.37±8.64





# Research results: Different pH of PB buffer

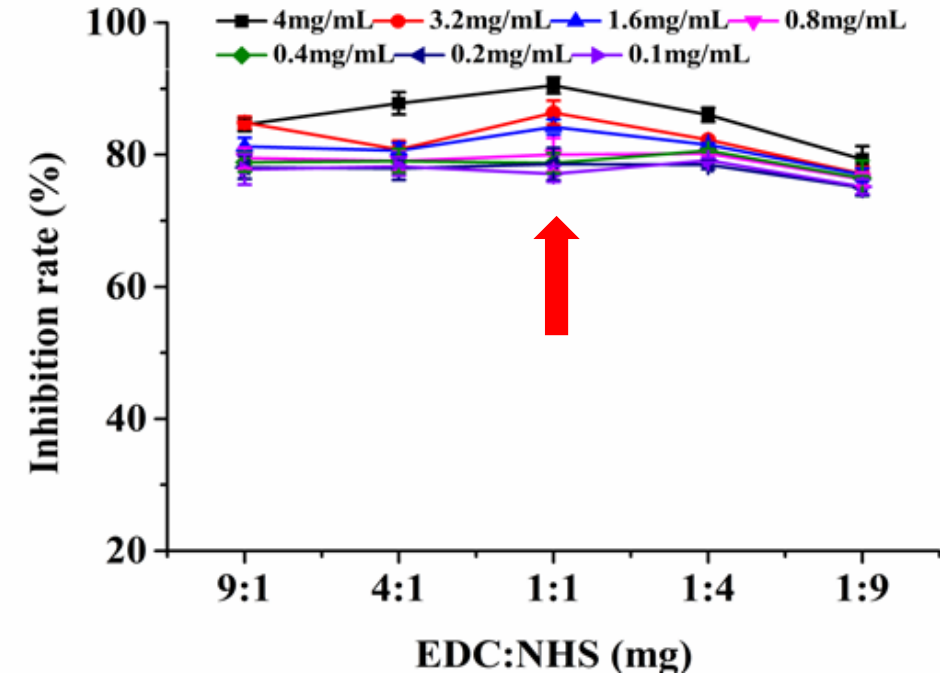
Concentration (mg/mL)	The pH of PB buffer					
	5.7	6.0	6.5	7.0	7.5	8.0
4	68.63±1.84	63.14±2.85	65.4±1.02	73.48±2.34	67.71±1.61	66.01±3.55
3.2	65.92±1.87	59.29±0.35	61.2±0.31	63.00±0.94	60.41±1.13	61.20±1.65
1.6	65.61±0.46	59.93±0.99	59.4±0.75	61.6±1.11	60.74±2.07	59.96±2.74
0.8	63.54±0.67	57.07±2.49	57.9±0.78	60.76±0.50	58.87±2.48	59.07±1.48
0.4	63.34±1.88	57.03±2.17	57.4±0.38	58.98±1.98	59.74±2.34	59.27±1.73
0.2	61.29±0.80	54.55±0.94	55.6±1.72	58.25±1.50	58.69±1.57	57.47±1.83
0.1	60.79±0.80	53.32±2.00	55.3±1.83	58.73±2.40	57.30±3.22	56.67±3.37





# Research results: Different molar mass of EDC and NHS

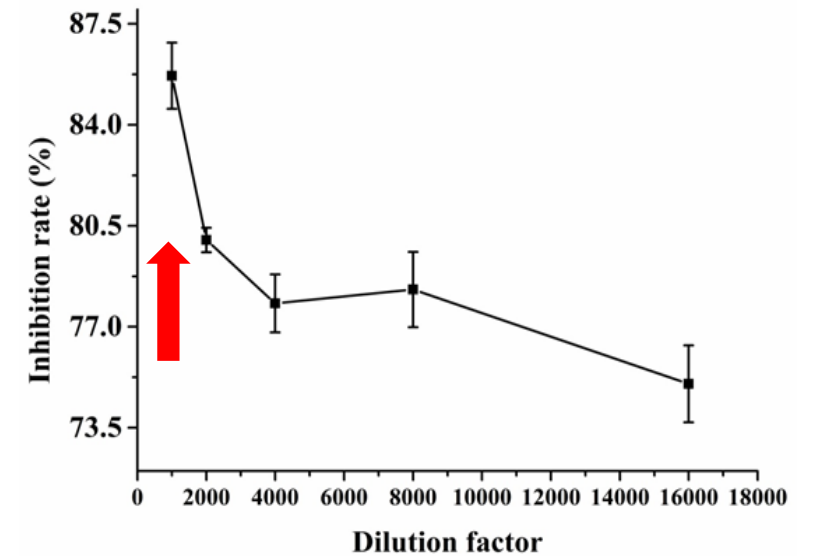
Concentration (mg/mL)	The molar mass ratio of EDC and NHS				
	9:1	4:1	1:1	1:4	1:9
4	84.57±1.02	87.79±1.67	90.4±1.24	86.04±1.06	79.29±1.97
3.2	84.87±0.90	80.76±1.37	86.3±1.82	82.25±0.36	77.11±1.05
1.6	81.25±1.30	80.62±1.15	84.2±1.12	81.51±0.22	76.97±0.96
0.8	79.48±1.57	79.07±1.59	80.0±2.50	80.15±0.25	76.26±0.98
0.4	78.86±1.46	79.05±1.81	78.7±1.52	80.62±0.25	76.42±2.66
0.2	78.09±1.75	78.22±1.40	78.5±2.45	79.15±0.32	75.00±1.17
0.1	77.78±2.32	77.90±1.73	77.0±1.22	78.50±0.70	75.16±1.13





# Research results: Different antibody dilution ratio

Antibody dilution ratio	1000	2000	4000	8000	16000
<u>Bacteriostatic rate (%)</u>	85.71±1.15	80.01±0.42	77.8±1.00	78.29±1.31	75.03±1.34





# Research results: Different types of nano-agents

**Table 1.** The inhibition rate of different types of nano-agents

Bacteriostatic agent	EC <sub>50</sub> (mg/mL)
MC	0.310
CAPE	0.165
API	0.248
PLGA-TNPs	0.021
PLGA-NPs	0.285

Compared with common PLGA Nano-agent, the median effective concentration of Targeted PLGA Nano-agents declined ranging from **0.285 mg/mL** to **0.021 mg/mL**, which shows good antibacterial properties.



# Conclusion

1

**Targeted PLGA Nano-agents** were successfully prepared.

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2

When **EDC: NHS= 1:1**, buffer **pH=7**, magnetic activation time of **30 min**, binding reaction time of **40 min**, antibody dilution times of 1000 times, the inhibition rate of nano-agents can reach to more than **90 %**.

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3

The  $EC_{50}$  value of targeted nanoparticles decreased from **0.285 mg/mL** to **0.021 mg/mL**, indicating that the nanoparticles had good antibacterial activity.

**Thanks for your  
listening**

