In Vitro Antimicrobial Activity of Novel Antimicrobial Peptide OMN51 Against Multi-drug Resistant Pseudomonas

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BACKGROUND

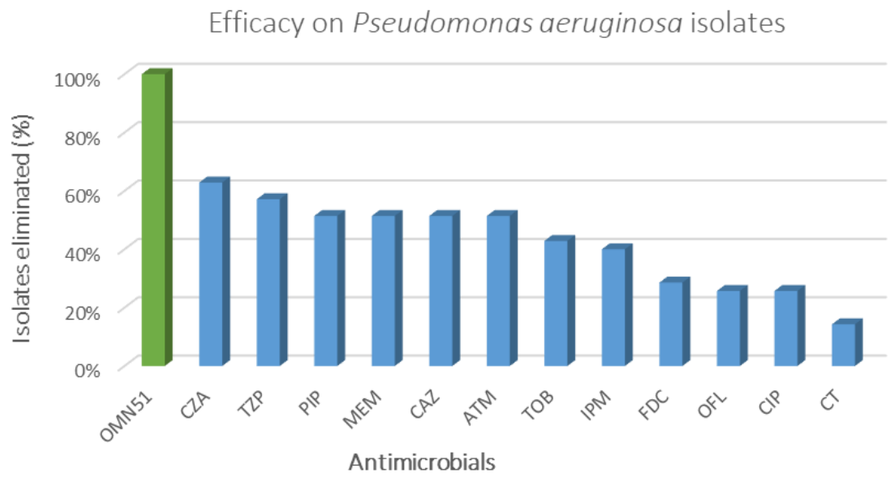
- Rising incidence of multi-drug resistance (MDR) Pseudomonas aeruginosa (PSA), most common and virulent of microbial infections among people with cystic fibrosis (pwCF)
- OMN51 is a novel bioengineered bactericidal antimicrobial peptide developed by Omnix Medical Ltd.
- OMN51 is a beta-hairpin antimicrobial peptide derived from the innate immune system of Capitella teleta
- OMN51 selectively disrupts the bacterial membrane, exerting a bactericidal effect on target bacteria
- OMN51 distinguishes between host cells and bacteria based on membrane lipid composition and net electric charge of bacterial membrane, and therefore is inert against host cells
- OMN51 compromises integrity of bacterial outer membranes, leading to proton gradient depletion and bacterial cell lysis, irrespective of bacterial antibiotic resistance profile
- We explored the effectiveness of OMN51 in MDR PSA in sputum derived from pwCF

METHODS

- Sputum cultures were collected from pwCF and PSA strains were isolated, cultured and incubated
- Bacterial inoculum was treated with OMN51 in culture wells and MIC values were measured
- MIC results were compared to antimicrobial activity of other antibiotics on the PSA bacterial strains

RESULTS

- OMN51 active against all 35 clinical isolates, irrespective of resistance profile
- Narrower MIC range (4–16 µg/mL) compared to the other antimicrobial agents
- Potent inhibitory effect on PSA bacteria, with MIC of ≤ 16 µg/mL, between the different tested bacterial strains
- Lowest MIC observed was 4 µg/mL, both in sensitive and resistant/MDR strains
- OMN51 not susceptible to the antimicrobial resistance mechanisms that affected other antimicrobial agents tested



OMN51 Activity In-Vitro

						Characterization											
No.	**Strain**	**Age**	**Gender**	**Resistance pattern**	**OAMP MIC [µg/mL]**	ATM	FDC	CAZ	CZA	CT	CIP	IPM	MEM	OFL	PIP	TZP	TOB
1	7005331	29	M	Susceptible	**4**	S	ND	S	S	ND	S	S	S	S	S	S	S
2	7005411	ND	ND	Susceptible	**4**	S	ND	S	S	ND	S	S	S	S	S	S	S
3	7005491	ND	ND	Susceptible	**4**	S	ND	S	S	ND	S	S	S	S	S	S	S
4	7007970	39	F	Susceptible	**8**	S	ND	S	S	ND	S	S	S	S	S	S	S
5	7007972	52	F	Susceptible	**8**	S	ND	S	S	ND	S	S	S	S	S	S	S
6	7003053	58	F	Susceptible	**8**	S	ND	S	S	ND	S	S	S	S	S	S	S
7	7005765	ND	ND	Susceptible	**8**	S	ND	S	S	ND	S	S	S	S	S	S	ND
8	7006246	70	F	Susceptible	**8**	S	ND	S	S	ND	S	S	S	S	S	S	ND
9	7002608	39	F	ND	**4**	I	ND	S	S	ND	S	S	S	S	S	S	S
10	7000847	ND	ND	ND	**8**	S	ND	S	S	ND	I	S	S	R	S	S	S
11	7001009	ND	ND	ND	**4**	S	ND	S	S	ND	R	S	S	R	S	S	ND
12	7006248	34	M	ND	**8**	S	ND	S	S	ND	R	S	S	R	S	S	ND
13	7007577	34	M	ND	**16**	S	ND	S	S	ND	R	S	S	R	S	S	ND
14	7007214	38	M	ND	**4**	S	ND	S	S	ND	I	R	S	R	S	S	S
15	7008582	40	F	ND	**4**	S	S	S	S	S	R	R	S	R	S	S	S
16	7000461	36	F	ND	**4**	S	S	S	S	ND	R	R	S	R	S	S	S
17	7006669	40	F	ND	**4**	S	ND	S	S	ND	R	R	S	R	S	S	S
18	7007277	36	F	MDR	**8**	S	ND	S	S	ND	R	R	S	R	R	S	S
19	7003240	40	F	MDR	**4**	S	S	R	S	ND	R	R	R	R	R	S	S
20	7006685	31	F	MDR	**16**	R	S	R	R	ND	R	S	R	R	S	S	R
21	7000031	32	F	MDR	**4**	R	S	R	S	S	R	R	R	R	R	R	S
22	7008034	38	M	MDR	**4**	R	S	R	S	S	R	R	R	R	R	R	R
23	7005508	36	F	MDR	**16**	R	R	R	S	S	R	R	R	R	R	R	R
24	7005154	36	F	MDR	**8**	R	S	R	R	S	R	R	R	R	R	R	R
25	7005142	63	F	MDR	**16**	R	S	R	R	R	R	R	R	R	R	R	R
26	7005775	34	M	MDR	**8**	R	S	R	R	R	R	R	R	R	R	R	R
27	7005779	ND	ND	MDR	**16**	R	S	R	R	R	R	R	R	R	R	R	R
28	7006437	32	F	MDR	**8**	R	I	R	R	ND	R	R	R	R	R	R	R
29	7007275	48	F	MDR	**16**	R	I	R	R	I	R	R	R	R	R	R	R
30	7005770	36	F	MDR	**8**	R	R	R	R	R	R	R	R	R	R	R	R
31	7005780	34	M	MDR	**16**	R	R	R	R	R	R	R	R	R	R	R	R
32	7007282	32	F	MDR	**8**	R	R	R	R	R	R	R	R	R	R	R	R
33	7008494	32	F	MDR	**16**	R	R	R	R	R	R	R	R	R	R	R	R
34	7008502	39	M	MDR	**16**	R	R	R	R	R	R	R	R	R	R	R	R
35	7002687	36	F	MDR	**8**	R	R	R	R	R	R	R	R	R	R	R	R

Abbreviations: ND no data, MDR multidrug resistant (i.e., resistant to all tested antimicrobials in the figure), ATM Aztreonam, FDC Cefiderocol, CAZ Ceftazadime, CZA Ceftazadime-Avibactam, CT Ceftazadime-Tazobactam, CIP Ciprofloxacin IPM Imipenem, MEM Meropenem, OFL Ofloxacin, PIP Pipercillin, TZP Pipercillin-tazobactam, TOB Tobramycin

CONCLUSIONS

- In vitro PoC of OMN51 antimicrobial activity against MDR PSA in clinical isolates from sputum of pwCF
- OMN51 mechanism is believed to have a lower propensity to develop antimicrobial resistance
- OMN51 is being developed as an inhaled therapy for pwCF
- Further clinical trials are planned to corroborate the initial in vitro findings

OMN51 is effective in-vitro against susceptible, resistant and MDR *Pseudomonas aeruginosa* clinical isolates