

The *cop* operon is required for copper homeostasis in
Streptococcus pneumoniae

Molecular Microbiology

81, 1255-1270

DOI: [10.1111/j.1365-2958.2011.07758.x](https://doi.org/10.1111/j.1365-2958.2011.07758.x)

Citation Report

#	ARTICLE	IF	CITATIONS
2	Copper toxicity and the origin of bacterial resistance—new insights and applications. <i>Metallomics</i> , 2011, 3, 1109.	1.0	297
3	Impact of Manganese, Copper and Zinc Ions on the Transcriptome of the Nosocomial Pathogen <i>Enterococcus faecalis</i> V583. <i>PLoS ONE</i> , 2011, 6, e26519.	1.1	53
4	CelR-mediated activation of the cellobiose-utilization gene cluster in <i>Streptococcus pneumoniae</i> . <i>Microbiology (United Kingdom)</i> , 2011, 157, 2854-2861.	0.7	31
5	Copper at the Front Line of the Host-Pathogen Battle. <i>PLoS Pathogens</i> , 2012, 8, e1002887.	2.1	86
6	Characterization of the ROK-family transcriptional regulator RokA of <i>Streptococcus pneumoniae</i> D39. <i>Microbiology (United Kingdom)</i> , 2012, 158, 2917-2926.	0.7	12
7	Phenotypic Characterization of a <i>copA</i> Mutant of <i>Neisseria gonorrhoeae</i> Identifies a Link between Copper and Nitrosative Stress. <i>Infection and Immunity</i> , 2012, 80, 1065-1071.	1.0	43
8	Characterization of Central Carbon Metabolism of <i>Streptococcus pneumoniae</i> by Isotopologue Profiling. <i>Journal of Biological Chemistry</i> , 2012, 287, 4260-4274.	1.6	75
9	Copper Homeostasis at the Host-Pathogen Interface. <i>Journal of Biological Chemistry</i> , 2012, 287, 13549-13555.	1.6	251
10	<i>Streptococcus pneumoniae</i> Uses Glutathione To Defend against Oxidative Stress and Metal Ion Toxicity. <i>Journal of Bacteriology</i> , 2012, 194, 6248-6254.	1.0	101
11	Metallobiology of host-pathogen interactions: an intoxicating new insight. <i>Trends in Microbiology</i> , 2012, 20, 106-112.	3.5	107
12	The siderophore yersiniabactin binds copper to protect pathogens during infection. <i>Nature Chemical Biology</i> , 2012, 8, 731-736.	3.9	263
13	A fine scale phenotype-genotype virulence map of a bacterial pathogen. <i>Genome Research</i> , 2012, 22, 2541-2551.	2.4	224
14	Metalloregulation of Gram-positive pathogen physiology. <i>Current Opinion in Microbiology</i> , 2012, 15, 169-174.	2.3	34
15	Copper in Microbial Pathogenesis: Meddling with the Metal. <i>Cell Host and Microbe</i> , 2012, 11, 106-115.	5.1	241
17	Nutritional immunity: transition metals at the pathogen-host interface. <i>Nature Reviews Microbiology</i> , 2012, 10, 525-537.	13.6	1,256
18	Metal ion acquisition in <i>Staphylococcus aureus</i> : overcoming nutritional immunity. <i>Seminars in Immunopathology</i> , 2012, 34, 215-235.	2.8	115
19	Bacterial killing in macrophages and amoeba: do they all use a brass dagger?. <i>Future Microbiology</i> , 2013, 8, 1257-1264.	1.0	67
20	The role of zinc in the interplay between pathogenic streptococci and their hosts. <i>Molecular Microbiology</i> , 2013, 88, 1047-1057.	1.2	45

#	ARTICLE	IF	CITATIONS
21	The effect of zinc limitation on the transcriptome of <i>Pseudomonas protegens</i> . Environmental Microbiology, 2013, 15, 702-715.	1.8	53
22	A new structural paradigm in copper resistance in <i>Streptococcus pneumoniae</i> . Nature Chemical Biology, 2013, 9, 177-183.	3.9	85
23	The Copper Metallome in Prokaryotic Cells. Metal Ions in Life Sciences, 2013, 12, 417-450.	2.8	64
24	Antimicrobial Action of Copper Is Amplified via Inhibition of Heme Biosynthesis. ACS Chemical Biology, 2013, 8, 2217-2223.	1.6	62
25	Porins Increase Copper Susceptibility of <i>Mycobacterium tuberculosis</i> . Journal of Bacteriology, 2013, 195, 5133-5140.	1.0	38
26	Cellobiose-Mediated Gene Expression in <i>Streptococcus pneumoniae</i> : A Repressor Function of the Novel GntR-Type Regulator BguR. PLoS ONE, 2013, 8, e57586.	1.1	31
27	The roles of transition metals in the physiology and pathogenesis of <i>Streptococcus pneumoniae</i> . Frontiers in Cellular and Infection Microbiology, 2013, 3, 92.	1.8	62
28	Role of transition metal exporters in virulence: the example of <i>Neisseria meningitidis</i> . Frontiers in Cellular and Infection Microbiology, 2013, 3, 102.	1.8	21
29	Host stress hormone norepinephrine stimulates pneumococcal growth, biofilm formation and virulence gene expression. BMC Microbiology, 2014, 14, 180.	1.3	65
30	Lactate Dehydrogenase Is the Key Enzyme for Pneumococcal Pyruvate Metabolism and Pneumococcal Survival in Blood. Infection and Immunity, 2014, 82, 5099-5109.	1.0	73
31	LacR Is a Repressor of <i>lacABCD</i> and LacT Is an Activator of <i>lacTFEG</i> , Constituting the <i>lac</i> Gene Cluster in <i>Streptococcus pneumoniae</i> . Applied and Environmental Microbiology, 2014, 80, 5349-5358.	1.4	31
32	Global discovery of colonization determinants in the squid symbiont <i>Vibrio fischeri</i> . Proceedings of the National Academy of Sciences of the United States of America, 2014, 111, 17284-17289.	3.3	93
33	Metallobiology of Tuberculosis. Microbiology Spectrum, 2014, 2, .	1.2	24
34	Copper Transport and Trafficking at the Host-Bacterial Pathogen Interface. Accounts of Chemical Research, 2014, 47, 3605-3613.	7.6	106
35	Respiratory Syncytial Virus Increases the Virulence of <i>Streptococcus pneumoniae</i> by Binding to Penicillin Binding Protein 1a. A New Paradigm in Respiratory Infection. American Journal of Respiratory and Critical Care Medicine, 2014, 190, 196-207.	2.5	115
36	Pathogenic adaptations to host-derived antibacterial copper. Frontiers in Cellular and Infection Microbiology, 2014, 4, 3.	1.8	103
37	The Regulation of the AdcR Regulon in <i>Streptococcus pneumoniae</i> Depends Both on Zn ²⁺ - and Ni ²⁺ -Availability. Frontiers in Cellular and Infection Microbiology, 2015, 5, 91.	1.8	10
38	Co ²⁺ -dependent gene expression in <i>Streptococcus pneumoniae</i> : opposite effect of Mn ²⁺ and Co ²⁺ on the expression of the virulence genes <i>psaBCA</i> , <i>pcpA</i> , and <i>prtA</i> . Frontiers in Microbiology, 2015, 6, 748.	1.5	9

#	ARTICLE	IF	CITATIONS
39	Maltose-Dependent Transcriptional Regulation of the mal Regulon by MalR in <i>Streptococcus pneumoniae</i> . PLoS ONE, 2015, 10, e0127579.	1.1	11
40	Ni ²⁺ -Dependent and PsaR-Mediated Regulation of the Virulence Genes <i>pcpA</i> , <i>psaBCA</i> , and <i>prtA</i> in <i>Streptococcus pneumoniae</i> . PLoS ONE, 2015, 10, e0142839.	1.1	9
41	Copper Tolerance and Characterization of a Copper-Responsive Operon, <i>copYAZ</i> , in an M1T1 Clinical Strain of <i>Streptococcus pyogenes</i> . Journal of Bacteriology, 2015, 197, 2580-2592.	1.0	21
42	Bacterial Copper Resistance and Virulence. , 2015, , 1-19.		9
43	The <i>copYAZ</i> Operon Functions in Copper Efflux, Biofilm Formation, Genetic Transformation, and Stress Tolerance in <i>Streptococcus mutans</i> . Journal of Bacteriology, 2015, 197, 2545-2557.	1.0	43
45	Fucose-Mediated Transcriptional Activation of the <i>fcs</i> Operon by FcsR in <i>Streptococcus pneumoniae</i> . Journal of Molecular Microbiology and Biotechnology, 2015, 25, 120-128.	1.0	5
46	GalR Acts as a Transcriptional Activator of <i>galkT</i> in the Presence of Galactose in <i>Streptococcus pneumoniae</i> . Journal of Molecular Microbiology and Biotechnology, 2015, 25, 363-371.	1.0	8
47	Role of Copper Efflux in Pneumococcal Pathogenesis and Resistance to Macrophage-Mediated Immune Clearance. Infection and Immunity, 2015, 83, 1684-1694.	1.0	80
48	Copper tolerance and virulence in bacteria. Metallomics, 2015, 7, 957-964.	1.0	235
49	Proteomic analysis of the copper resistance of <i>Streptococcus pneumoniae</i> . Metallomics, 2015, 7, 448-454.	1.0	15
50	Sialic Acid-Mediated Gene Expression in <i>Streptococcus pneumoniae</i> and Role of NanR as a Transcriptional Activator of the <i>nan</i> Gene Cluster. Applied and Environmental Microbiology, 2015, 81, 3121-3131.	1.4	19
51	Ascorbic acid-dependent gene expression in <i>Streptococcus pneumoniae</i> and the activator function of the transcriptional regulator UlaR2. Frontiers in Microbiology, 2015, 6, 72.	1.5	22
52	The Role of Copper and Zinc Toxicity in Innate Immune Defense against Bacterial Pathogens. Journal of Biological Chemistry, 2015, 290, 18954-18961.	1.6	324
53	Copper intoxication inhibits aerobic nucleotide synthesis in <i>Streptococcus pneumoniae</i> . Metallomics, 2015, 7, 786-794.	1.0	53
54	Transcriptional profiling of UlaR-regulated genes in <i>Streptococcus pneumoniae</i> . Genomics Data, 2015, 4, 57-59.	1.3	27
55	Genome-Wide Identification of <i>Klebsiella pneumoniae</i> Fitness Genes during Lung Infection. MBio, 2015, 6, e00775.	1.8	168
56	Characterization of Three <i>Mycobacterium</i> spp. with Potential Use in Bioremediation by Genome Sequencing and Comparative Genomics. Genome Biology and Evolution, 2015, 7, 1871-1886.	1.1	17
57	Regulatory Strategies of the Pneumococcus. , 2015, , 109-128.		1

#	ARTICLE	IF	CITATIONS
58	Effects of In-Feed Copper, Chlortetracycline, and Tylosin on the Prevalence of Transferable Copper Resistance Gene, <i>ctrB</i> , Among Fecal Enterococci of Weaned Piglets. Foodborne Pathogens and Disease, 2015, 12, 670-678.	0.8	23
59	UlaR activates expression of the ula operon in Streptococcus pneumoniae in the presence of ascorbic acid. Microbiology (United Kingdom), 2015, 161, 41-49.	0.7	20
60	Interactions and Mechanisms of Respiratory Tract Biofilms Involving Streptococcus Pneumoniae and Nontypeable Haemophilus Influenzae. , 2016, , .		2
61	N-acetylgalatosamine-Mediated Regulation of the aga Operon by AgaR in Streptococcus pneumoniae. Frontiers in Cellular and Infection Microbiology, 2016, 6, 101.	1.8	18
62	Cysteine-Mediated Gene Expression and Characterization of the CmbR Regulon in Streptococcus pneumoniae. Frontiers in Microbiology, 2016, 7, 1929.	1.5	5
63	Streptococcus mutans copper chaperone, CopZ, is critical for biofilm formation and competitiveness. Molecular Oral Microbiology, 2016, 31, 515-525.	1.3	20
65	Stress Physiology of Lactic Acid Bacteria. Microbiology and Molecular Biology Reviews, 2016, 80, 837-890.	2.9	487
66	Evolution of a heavy metal homeostasis/resistance island reflects increasing copper stress in Enterobacteria. Genome Biology and Evolution, 2016, 8, eww031.	1.1	68
67	Understanding the antimicrobial activity behind thin- and thick-rolled copper plates. Applied Microbiology and Biotechnology, 2016, 100, 5569-5580.	1.7	13
68	The S2 Cu(<i>scp</i>) site in CupA from Streptococcus pneumoniae is required for cellular copper resistance. Metallomics, 2016, 8, 61-70.	1.0	18
69	Transition Metal Homeostasis in Streptococcus pyogenes and Streptococcus pneumoniae. Advances in Microbial Physiology, 2017, 70, 123-191.	1.0	32
70	Metal homeostasis in bacteria: the role of ArsR/SmtB family of transcriptional repressors in combating varying metal concentrations in the environment. BioMetals, 2017, 30, 459-503.	1.8	40
71	Identifying key genes in rheumatoid arthritis by weighted gene co-expression network analysis. International Journal of Rheumatic Diseases, 2017, 20, 971-979.	0.9	62
72	Interplay between tolerance mechanisms to copper and acid stress in Escherichia coli. Proceedings of the National Academy of Sciences of the United States of America, 2017, 114, 6818-6823.	3.3	57
73	Copper and Antibiotics. Advances in Microbial Physiology, 2017, 70, 193-260.	1.0	96
74	Copper Is a Host Effector Mobilized to Urine during Urinary Tract Infection To Impair Bacterial Colonization. Infection and Immunity, 2017, 85, .	1.0	48
75	Copper Chaperone CupA and Zinc Control CopY Regulation of the Pneumococcal <i>cop</i> Operon. MSphere, 2017, 2, .	1.3	19
76	Zincing it out: zinc homeostasis mechanisms and their impact on the pathogenesis of human pathogen group A streptococcus. Metallomics, 2017, 9, 1693-1702.	1.0	18

#	ARTICLE	IF	CITATIONS
77	One gene, two proteins: coordinated production of a copper chaperone by differential transcript formation and translational frameshifting in <i>Escherichia coli</i> . <i>Molecular Microbiology</i> , 2017, 106, 635-645.	1.2	10
78	Copper homeostasis networks in the bacterium <i>Pseudomonas aeruginosa</i> . <i>Journal of Biological Chemistry</i> , 2017, 292, 15691-15704.	1.6	100
79	Evolution of mobile genetic element composition in an epidemic methicillin-resistant <i>Staphylococcus aureus</i> : temporal changes correlated with frequent loss and gain events. <i>BMC Genomics</i> , 2017, 18, 684.	1.2	43
80	CodY Regulates Thiol Peroxidase Expression as Part of the Pneumococcal Defense Mechanism against H ₂ O ₂ Stress. <i>Frontiers in Cellular and Infection Microbiology</i> , 2017, 7, 210.	1.8	16
81	Metallochaperones and metalloregulation in bacteria. <i>Essays in Biochemistry</i> , 2017, 61, 177-200.	2.1	103
82	Contact killing and antimicrobial properties of copper. <i>Journal of Applied Microbiology</i> , 2018, 124, 1032-1046.	1.4	417
83	A horizontally gene transferred copper resistance locus confers hyper-resistance to antibacterial copper toxicity and enables survival of community acquired methicillin resistant <i>Staphylococcus aureus</i> USA300 in macrophages. <i>Environmental Microbiology</i> , 2018, 20, 1576-1589.	1.8	48
84	Metal-dependent allosteric activation and inhibition on the same molecular scaffold: the copper sensor CopY from <i>Streptococcus pneumoniae</i> . <i>Chemical Science</i> , 2018, 9, 105-118.	3.7	27
85	NADH-Mediated Gene Expression in <i>Streptococcus pneumoniae</i> and Role of Rex as a Transcriptional Repressor of the Rex-Regulon. <i>Frontiers in Microbiology</i> , 2018, 9, 1300.	1.5	6
86	Differential Susceptibility of <i>Mycoplasma</i> and <i>Ureaplasma</i> Species to Compound-Enhanced Copper Toxicity. <i>Frontiers in Microbiology</i> , 2019, 10, 1720.	1.5	12
87	Adaptation to Adversity: the Intermingling of Stress Tolerance and Pathogenesis in Enterococci. <i>Microbiology and Molecular Biology Reviews</i> , 2019, 83, .	2.9	58
88	Copper stress in <i>Staphylococcus aureus</i> leads to adaptive changes in central carbon metabolism. <i>Metallomics</i> , 2019, 11, 183-200.	1.0	51
89	CopA Protects <i>Streptococcus suis</i> against Copper Toxicity. <i>International Journal of Molecular Sciences</i> , 2019, 20, 2969.	1.8	12
90	Metals as phagocyte antimicrobial effectors. <i>Current Opinion in Immunology</i> , 2019, 60, 1-9.	2.4	99
91	The role of metal ions in the virulence and viability of bacterial pathogens. <i>Biochemical Society Transactions</i> , 2019, 47, 77-87.	1.6	83
92	Involvement of Various Enzymes in the Physiology and Pathogenesis of <i>Streptococcus suis</i> . <i>Veterinary Sciences</i> , 2020, 7, 143.	0.6	2
93	Exploring metal availability in the natural niche of <i>Streptococcus pneumoniae</i> to discover potential vaccine antigens. <i>Virulence</i> , 2020, 11, 1310-1328.	1.8	8
94	Cadmium stress dictates central carbon flux and alters membrane composition in <i>Streptococcus pneumoniae</i> . <i>Communications Biology</i> , 2020, 3, 694.	2.0	19

#	ARTICLE	IF	CITATIONS
95	Transcriptomic Analysis of <i>Streptococcus suis</i> in Response to Ferrous Iron and Cobalt Toxicity. <i>Genes</i> , 2020, 11, 1035.	1.0	2
96	Role of Glutathione in Buffering Excess Intracellular Copper in <i>Streptococcus pyogenes</i> . <i>MBio</i> , 2020, 11, .	1.8	40
97	Multicopper oxidase of <i>Acinetobacter baumannii</i> : Assessing its role in metal homeostasis, stress management and virulence. <i>Microbial Pathogenesis</i> , 2020, 143, 104124.	1.3	5
98	Characterization of <i>Acinetobacter baumannii</i> Copper Resistance Reveals a Role in Virulence. <i>Frontiers in Microbiology</i> , 2020, 11, 16.	1.5	38
99	Rules of Expansion: an Updated Consensus Operator Site for the CopR-CopY Family of Bacterial Copper Exporter System Repressors. <i>MSphere</i> , 2020, 5, .	1.3	9
100	Changes in mammalian copper homeostasis during microbial infection. <i>Metallomics</i> , 2020, 12, 416-426.	1.0	25
101	<i>Staphylococcus aureus</i> lacking a functional MntABC manganese import system has increased resistance to copper. <i>Molecular Microbiology</i> , 2021, 115, 554-573.	1.2	20
103	Investigation of Stress Response Genes in Antimicrobial Resistant Pathogens Sampled from Five Countries. <i>Processes</i> , 2021, 9, 927.	1.3	6
104	Copper Homeostatic Mechanisms and Their Role in the Virulence of <i>Escherichia coli</i> and <i>Salmonella enterica</i> . <i>EcoSal Plus</i> , 2021, 9, eESP00142020.	2.1	18
105	CopA Protects <i>Actinobacillus pleuropneumoniae</i> against Copper Toxicity. <i>Veterinary Microbiology</i> , 2021, 258, 109122.	0.8	2
107	The Rgg1518 transcriptional regulator is a necessary facet of sugar metabolism and virulence in <i>Streptococcus pneumoniae</i> . <i>Molecular Microbiology</i> , 2021, 116, 996-1008.	1.2	8
108	Whole Genome Sequencing of Methicillin-Resistant <i>Staphylococcus epidermidis</i> Clinical Isolates Reveals Variable Composite SCCmec ACME among Different STs in a Tertiary Care Hospital in Oman. <i>Microorganisms</i> , 2021, 9, 1824.	1.6	4
109	Copper Intoxication in Group B <i>Streptococcus</i> Triggers Transcriptional Activation of the <i>cop</i> Operon That Contributes to Enhanced Virulence during Acute Infection. <i>Journal of Bacteriology</i> , 2021, 203, e0031521.	1.0	12
111	Enhanced copper-resistance gene repertoire in <i>Alteromonas macleodii</i> strains isolated from copper-treated marine coatings. <i>PLoS ONE</i> , 2021, 16, e0257800.	1.1	5
112	Copper Resistance Promotes Fitness of Methicillin-Resistant <i>Staphylococcus aureus</i> during Urinary Tract Infection. <i>MBio</i> , 2021, 12, e0203821.	1.8	17
113	Methionine-mediated gene expression and characterization of the CmhR regulon in <i>Streptococcus pneumoniae</i> . <i>Microbial Genomics</i> , 2016, 2, e000091.	1.0	14
114	Copper-responsive gene regulation in bacteria. <i>Microbiology (United Kingdom)</i> , 2012, 158, 2451-2464.	0.7	159
117	Metallobiology of Tuberculosis. , 0, , 377-387.		2

#	ARTICLE	IF	CITATIONS
118	Magnesium, Copper and Cobalt. , 2017, , 81-94.		0
119	From Copper Tolerance to Resistance in <i>Pseudomonas aeruginosa</i> towards Patho-Adaptation and Hospital Success. <i>Genes</i> , 2022, 13, 301.	1.0	18
121	Prospects for the creation of antimicrobial preparations based on copper and copper oxides nanoparticles. <i>Acta Biomedica Scientifica</i> , 2021, 6, 37-50.	0.1	1
122	The Copper Resistome of Group B <i>Streptococcus</i> Reveals Insight into the Genetic Basis of Cellular Survival during Metal Ion Stress. <i>Journal of Bacteriology</i> , 2022, 204, e0006822.	1.0	3
123	Role of horizontally transferred copper resistance genes in <i>Staphylococcus aureus</i> and <i>Listeria monocytogenes</i> . <i>Microbiology (United Kingdom)</i> , 2022, 168, .	0.7	6
128	Regulatory cross-talk supports resistance to Zn intoxication in <i>Streptococcus</i> . <i>PLoS Pathogens</i> , 2022, 18, e1010607.	2.1	4
129	Copper microenvironments in the human body define patterns of copper adaptation in pathogenic bacteria. <i>PLoS Pathogens</i> , 2022, 18, e1010617.	2.1	26
130	Metal Homeostasis in Pathogenic <i>Streptococci</i> . <i>Microorganisms</i> , 2022, 10, 1501.	1.6	5
131	ZccE is a Novel P-type ATPase That Protects <i>Streptococcus mutans</i> Against Zinc Intoxication. <i>PLoS Pathogens</i> , 2022, 18, e1010477.	2.1	7
133	In silico genomic analysis of <i>Rhodopseudomonas palustris</i> strains revealed potential biocontrol agents and crop yield enhancers. <i>Biological Control</i> , 2022, 176, 105085.	1.4	9
134	The <i>MerR</i> family regulator <i>NmlR</i> is involved in the defense against oxidative stress in <i>Streptococcus pneumoniae</i> . <i>Molecular Microbiology</i> , 2023, 119, 191-207.	1.2	6
135	Host-Mediated Copper Stress Is Not Protective against <i>Streptococcus pneumoniae</i> D39 Infection. <i>Microbiology Spectrum</i> , 2022, 10, .	1.2	3
136	Mutations in <i>troABCD</i> against Copper Overload in a <i>copA</i> Mutant of <i>Streptococcus suis</i> . <i>Applied and Environmental Microbiology</i> , 2023, 89, .	1.4	2
137	The role of CopA in <i>Streptococcus pyogenes</i> copper homeostasis and virulence. <i>Journal of Inorganic Biochemistry</i> , 2023, 240, 112122.	1.5	2
138	Conformations and Local Dynamics of the CopY Metal Sensor Revealed by EPR Spectroscopy. <i>Biochemistry</i> , 2023, 62, 797-807.	1.2	2
139	Metal manipulators and regulators in human pathogens: A comprehensive review on microbial redox copper metalloenzymes – multicopper oxidases and superoxide dismutases. <i>International Journal of Biological Macromolecules</i> , 2023, 233, 123534.	3.6	4
140	Copper Efflux System Required in Murine Lung Infection by <i>Haemophilus influenzae</i> Composed of a Canonical ATPase Gene and Tandem Chaperone Gene Copies. <i>Infection and Immunity</i> , 2023, 91, .	1.0	1