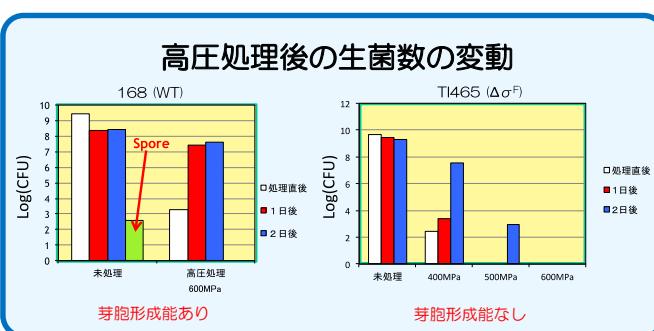


高圧損傷菌の回復メカニズムの解析

—高压処理を利用した微生物制御技術の高度化に向けて—

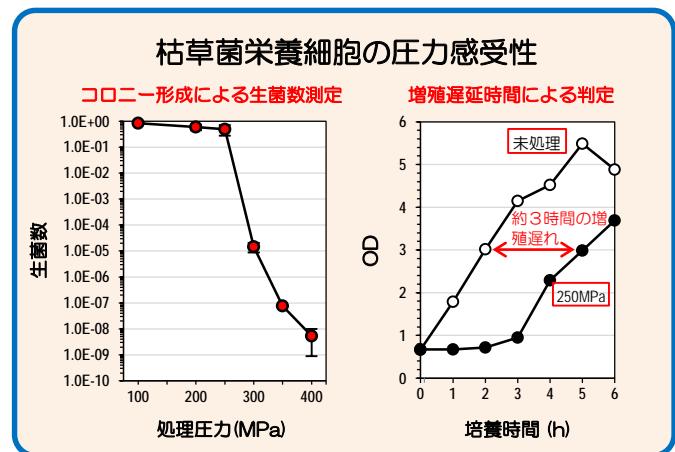
研究の内容

近年、高圧加工食品市場は急速に拡大していますが、高圧処理によって生じる細菌損傷についての知見はごくわずかです。本研究では、高圧処理により損傷した細菌の回復メカニズムを明らかにし、高圧処理を利用した微生物制御技術の高度化を目指しています。



今後の展開

- 様々な細菌の高圧損傷菌の特性の比較
- 高圧損傷菌の回復メカニズムの解明



高圧損傷した枯草菌栄養細胞におけるトランスクリプトーム解析

Genes induced during recovery phase of HHP-injured cells

Gene	Operon	Gene product (function)	2h / 0h	4h / 0h	4h / 2h
citB	-	Aconitase	1(2.89)	-	-
intA	S10-spC-a	Translational initiation factor II-3	1(3.46)	-	-
intC	infC-crml-rrtP	Translational initiation factor II-3	1(2.88)	-	-
map	S10-spC-a	Methionine aminopeptidase	1(2.67)	-	-
mtlD	mtlAD	Mannitol-1-phosphate 5-dehydrogenase	1(3.01)	-	-
pdhA	pdhAB	Pyruvate dehydrogenase (E1 alpha subunit)	1(2.32)	-	-
pstA	pstSCAB	Phosphate ABC transporter (permease)	1(4.03)	-	-
rstS	-	Phosphate ABC transporter (binding protein)	1(3.94)	-	-
rplE	S10-spC-a	Ribosomal protein L5	1(3.04)	-	-
rplJ	rplJ	Ribosomal protein L10	1(2.50)	-	-
rplN	S10-spC-a	Ribosomal protein L14	1(3.33)	-	-
rplP	-	Ribosomal protein L16	1(3.47)	-	-
rplR	S10-spC-a	Ribosomal protein L18	1(3.02)	-	-
rpmC	S10-spC-a	Ribosomal protein L29	1(3.48)	-	-
rpmE	Rho-rpmE	Ribosomal protein L31	1(2.16)	-	-
rpsN	S10-spC-a	Ribosomal protein S14	1(2.94)	-	-
rpsO	S10-spC-a	Ribosomal protein S17	1(3.15)	-	-
tuaG	tuaA-H	Biosynthesis of leichuromic acid: pho regulon	1(2.89)	-	-
ybtN	ybtN-rpmP	Unknown	1(3.16)	-	-
yubF	yigY-yubF	Unknown	1(2.81)	-	-
yugI	-	General stress protein found in the ribosome fraction	1(3.14)	-	-
clpE	-	Cip ATCase	1(4.89)	1(1.52)	-
-	-	Cold shock protein	1(2.77)	1(3.52)	-
rlpA	nusG-rpk-rpIA	Ribosomal protein L1	1(2.78)	1(2.95)	-
rlpS	yigY-rimM-rmD	Ribosomal protein L19	1(3.63)	1(2.93)	-
rpmJ	S10-spC-a	Ribosomal protein L36	1(3.38)	1(2.56)	-
tig	-?	Trigger factor	1(2.89)	1(3.72)	-
yneEF	yneEF2	Unknown	1(5.68)	1(5.24)	-
yozC	-	Unknown	1(2.42)	1(3.06)	-
cspD	-	Cold shock protein	1(2.71)	1(4.58)	1(1.87)
groES	groESL	10kDa chaperone	1(3.74)	1(5.27)	1(1.53)
abf	-	Antibiotic regulator controls biofilm formation and antibiotic resistance	1(3.61)	1(2.30)	-
acnC	-	Acyl carrier protein	1(4.33)	1(2.61)	-
fusA	fusABCyba	Siderophore binding protein (Fur regulon)	1(3.59)	1(4.38)	-
ydbN	-	Unknown (Fur regulon)	1(5.40)	1(3.94)	-
yifY	-	Siderophore uptake? (Fur regulon)	1(4.15)	1(3.67)	-
ykUN	ykUNOP	Flavodoxin	1(3.30)	1(4.07)	-
yoTA	yoTA	Unknown: SP-8 protein	1(4.04)	1(4.47)	-
yqgA	-	Unknown: cell wall binding protein	1(4.37)	1(3.22)	-
ysbA	ysbAB	Murein hydrolase regulator LrgA: essential for pyruvate utilization	1(5.92)	1(6.58)	-
ysbB	ysbAB	Antithiol-like protein LrgB	1(4.93)	1(5.67)	-
hsq	-	Flavodoxin	1(5.53)	1(3.39)	-
hsx	-	Non-specific DNA-binding protein HsBx	1(3.39)	1(2.39)	-
rbsA	rbsRKDABC	Ribos ABC transporter (ATP-binding protein)	1(3.88)	1(2.79)	-
spoVG	-	Stage V sporulation protein G (spore cortex synthesis)	1(2.79)	-	-
ykU1	ykUNOP	Flavodoxin	1(4.18)	-	-
yoLB	-	Unknown: SP-8 protein	1(3.48)	-	-
ywsB	-	Unknown: cell wall binding protein	1(3.31)	-	-

Genes repressed during recovery phase of HHP-injured cells

Gene	Operon	Gene product (function)	2h / 0h	4h / 0h	4h / 2h
ahpC	ahpCF	Alkyl hydroperoxide reductase (small subunit)	1(-3.94)	-	-
ahpC	ahpCF	Alkyl hydroperoxide reductase (large subunit)	1(-3.64)	-	-
bldBAA	bldA	Branched-chain alpha-keto acid dehydrogenase E1 subunit	1(-2.58)	-	-
clzZ	-	Citrate synthase II	1(-2.69)	-	-
csbD	ywmF-csbD?	General stress protein	1(-3.39)	-	-
gapB	gapB-scpD	Glyceraldehyde-3-phosphate dehydrogenase	1(-2.47)	-	-
haa	-	Flagellin protein	1(-4.46)	-	-
mraT	mraTBCD	Manganese ABC transporter (membrane protein)	1(-2.89)	-	-
mraT	mraTBCD	Manganese ABC transporter (ATP-binding protein)	1(-3.33)	-	-
pckA	-	Phosphoenolpyruvate carboxykinase	1(-2.92)	-	-
rbsA	rbsRKDABC	Ribos ABC transporter (ATP-binding protein)	1(-3.16)	-	-
spoVG	-	Stage V sporulation protein G (spore cortex synthesis)	1(-3.32)	-	-
yltT	-	General stress protein	1(-3.16)	-	-
yggZ(mgsR)	-	SpoIIE paralog controls a subregulon within general stress response	1(-3.77)	-	-
ytxH	ytxGHJ?	General stress protein	1(-2.55)	-	-
yvdD	-	Dimerization of 70S ribosome	1(-4.45)	-	-
ywsB	-	Unknown: putative cell wall binding protein	1(-3.27)	-	-
ysbA	-	General stress protein	1(-2.78)	-	-
lata	-	Manganese ABC transporter	1(-4.06)	1(-3.52)	-
mraC	mraTBCD	Manganese ABC transporter (membrane protein)	1(-3.40)	1(-3.94)	-
mraG	-	Metalloregulation DNA-binding stress protein: <i>E. coli</i> Dps homolog	1(-3.34)	1(-3.02)	-
srfaA	srfaBCD	Surfactin synthetase	1(-2.45)	1(-2.60)	-
ybvB	-	Unknown	1(-4.72)	1(-3.16)	-
ybvC	-	General stress protein	1(-2.86)	1(-2.55)	-
ykvZ	-	General stress protein	1(-3.94)	1(-3.57)	-
appC	appBC	Oligopeptide ABC transporter (permease)	1(-1.97)	1(-1.94)	-
phrA	rapA-phrA	Phosphatase RapA inhibitor	1(-1.84)	1(-1.76)	1(-1.92)
rapA	rapA-phrA	Response regulator aspartate phosphatase	1(-2.08)	1(-3.75)	1(-1.67)
ybcO (skfA)	skfABCDEF	Sporulation killing factor	1(-2.22)	1(-3.62)	1(-1.4)
yvdF	yvdFGHJ	Inducer of LrpS	1(-2.65)	1(-3.83)	1(-1.19)
mraT	mraTBCD	Manganese ABC transporter	1(-2.76)	-	-
nhaX	nhaXC	Regulator of nhaC	1(-2.67)	-	-
srfAB	srfABC	Surfactin synthetase	1(-2.59)	-	-
clpE	-	Cip ATCase	1(-3.45)	-	-
pstA	pstSCAB	Phosphate ABC transporter (permease)	1(-3.40)	-	-
mtlD	mtlAD	Mannitol-1-phosphate 5-dehydrogenase	1(-3.26)	-	-
citB	-	Aconitase	1(-2.39)	-	-
tuaG	tuaABCDEF	Biosynthesis of leichuromic acid: pho regulon	1(-2.39)	-	-

The value in parentheses indicates the average value of log₂ Ratio between two independent microarray results.

Translation Fur regulon PerR regulon MntR regulon
induced by iron limitation induced by peroxide stress induced by Mn(II) limitation

参考文献

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