

Table 5
Examples of secreted recombinant proteins

Protein	Signal	Promoter	Level	Location	Scale	Reference
β -Lactoglobulin	PelB	<i>T7</i>	33 ng/ μ g	Periplasm	(n/a)	(Chatel et al., 1999)
Antibodies	PelB	<i>arabinose</i>	700 mg/l	Medium	Fermenter, 14 l, OD 100	(Better et al., 1993)
Antifreeze peptide	OmpA	<i>tac</i>	16 mg/l	Medium	Shake flask, 200 ml, OD 2	(Tong et al., 2000)
bGPF	OmpA	<i>T7</i>	8 mg/l	Periplasm	Shake flask, vol and OD (n/a)	(Loo et al., 2002)
bPT inhibitor	SpA	<i>spA</i>	200 mg/l	Periplasm	Shake flask, 25 ml, OD (n/a)	(Nilsson and Abrahmsen, 1990)
CBD	Cex	<i>tac</i>	2.8 g/l	Periplasm	Fermenter, 1.5 l, OD 180	(Hasenwinkle et al., 1997)
Chitin deacetylase	Chitinase	<i>T7</i>	5.58 mg/l	Medium	Shake flask, 100 ml, OD 1.6	(Tokuyasu et al., 1999)
Cholera toxin B	OmpA	<i>arabinose</i>	1 g/l	Medium	Fermenter, 20 l, CDW 20 g/l	(Slos et al., 1994)
Cytochrome P450	PhoA	<i>phoA</i>	0.6 μ M	Periplasm	Shake flask, 500 ml OD (n/a)	(Kaderbhai et al., 2001)
Growth hormone	OmpA	<i>lpp/lac</i>	28.4 mg/l	Periplasm	Shake flask, 1 l, OD 1.6	(Becker and Hsiung, 1986)
Growth hormone	DsbA	<i>lambda</i>	12 μ g/ml	Periplasm	Shake flask, 100 ml, OD 3	(Soares et al., 2003)
hEGF	PhoA	<i>tac</i>	800 μ g/l	Periplasm	Shake flask, vol and OD (n/a)	(Engler et al., 1988)
hGCSF	Exl	<i>trc</i>	3.2 g/l	Periplasm	Shake flask, 50 ml, OD (n/a)	(Jeong and Lee, 2001)
Hirudin	Asparaginase	<i>tac</i>	60 mg/l	Medium	Shake flask, 1 l, OD 6	(Tan et al., 2002)
Human leptin	Enx	<i>T7</i>	150 mg/l	Periplasm	Shake flask, 50 ml, OD (n/a)	(Jeong and Lee, 2000)
Human proinsulin	SpA	<i>spA</i>	28 μ g/l	Medium	Shake flask, 100 ml, OD 1.5	(Mergulhão et al., 2001)
Human proinsulin	DsbA	<i>trc</i>	9.2 mg/g	Periplasm	Shake flask, 500 ml, OD 1	(Winter et al., 2001)
Human proinsulin	SpA	<i>spA</i>	1.2 mg/l	Periplasm	Shake flask, 25 ml, OD 2	(Mergulhão et al., 2000)
IGF-I	LamB	<i>arabinose</i>	2.5 g/l	Periplasm	Fermenter, 10 l, OD (n/a)	(Joly et al., 1998)
IGF-I	SpA	<i>spA</i>	30 mg/l	Periplasm	Shake flask, vol and OD (n/a)	(Samuelsson et al., 1996)
IGF-I	SpA	<i>spA</i>	10 μ g/l	Periplasm	(n/a)	(Hammarberg et al., 1989)

Table 5 (continued)

Protein	Signal	Promoter	Level	Location	Scale	Reference
IGF-I	SpA	<i>spA</i>	30 mg/l	Medium	Fermenter, 10 l, OD (n/a)	(Moks et al., 1987)
IGF-I	SpA	<i>spA</i>	51 mg/l	Medium	Fermenter, 7 l, OD 25	(Abrahmsen et al., 1986)
IGF-I fragment	SpA	<i>spA</i>	5 mg/l	Medium	Shake flask, 1 l, OD (n/a)	(Lowenadler et al., 1987)
Immunotoxins	PelB	<i>T7</i>	0.6 g/l	Periplasm	Shake flask, 1 l, CDW 4 g/l	(Barth et al., 2000)
Leptin	OmpA	<i>lpp/lac</i>	4.5 mg/l	Periplasm	Shake flask, 500 ml, OD 1.5	(Guisez et al., 1998)
LFT	Seq X	<i>lac</i>	4 g/l	Medium	Fermenter, 5 l, OD 140	(Lee et al., 2001)
Miniproinsulin	SpA	<i>spA</i>	75 mg/l	Periplasm	(n/a)	(Kang and Yoon, 1994)
Mouse endostatin	PhoA	<i>phoA</i>	40 mg/l	Medium	Fermenter, 10 l, OD (n/a)	(Xu et al., 2002)
PhoA	PhoA	<i>phoA</i>	3400 U/mg	Periplasm	(n/a)	(Mikhaleva et al., 2001)
PhoA	Enx	<i>trc</i>	5.2 g/l	Periplasm	Fermenter, 6 l, OD 150	(Choi et al., 2000)
Phos D	PelB	<i>T7</i>	1.3 mg/l	Medium	Shake flask, 500 ml, OD 3	(Zambonelli et al., 2003)
Salmon calcitonin	OmpA	<i>tac/lac</i>	210 mg/l	Medium	Fermenter, 1 l, OD (n/a)	(Ray et al., 2002)
scFv antibody	PelB	<i>lambda</i>	160 mg/l	Medium	Fermenter, 4 l, OD 50	(Mukherjee et al., 2004)
scFV fragments	PelB	<i>T7</i>	19 µg/ml	Periplasm	Shake flask, vol and OD (n/a)	(Oelschlaeger et al., 2003)
scFV multimers	PelB	<i>lambda</i>	1 mg/l	Periplasm	Fermenter, 10 l, OD 14	(Bayly et al., 2002)
Staphylokinase	OmpA	<i>tac</i>	15 µg/ml	Periplasm	Shake flask, 250 ml, CDW 0.5 g/l	(Lee et al., 1998)
TPA	SthII	<i>arabinose</i>	180 µg/l	Periplasm	Fermenter, 15 l, OD 100	(Qiu et al., 1998)
TPA derivatives	OmpA	<i>lac</i>	29.6 µg/l	Medium	Shake flask, 100 ml, OD (n/a)	(Manosroi et al., 2001)
TPA variant	PelB	<i>T7</i>	4 ng/ml	Periplasm	Shake flask, vol and OD (n/a)	(Schaffner et al., 2001)

bGPF—bacterial glycoamidase PNGase F; bPT—bovine pancreatic trypsin; CBD—cellulose binding domain; CDW—cell dry weight; Cex—cellulase from *Cellulomonas fimi*; Enx—endoxyranase from *Bacillus* sp.; ExI—*Bacillus* sp. signal peptide; hEGF—human epidermal growth factor; hGCSF—human granulocyte colony-stimulating factor; IGF-I—insulin-like growth factor I; LFT—levan fructotransferase; *lpp*—lipoprotein promoter; OmpA—outer membrane protease A; PelB—pectate lysate from *Erwinia carotovora*; PhoA—alkaline phosphatase; Phos D—Phospholipase D; scFv—single chain variable fragment; Seq X—TMITNSSSV (Lac Z derived); Spa—protein A from *Staphylococcus aureus*; SthII—heat-stable enterotoxin II.

Note: Scale information is included when it is available from the cited reference. When it is not available, it is indicated by (n/a).