Fig1

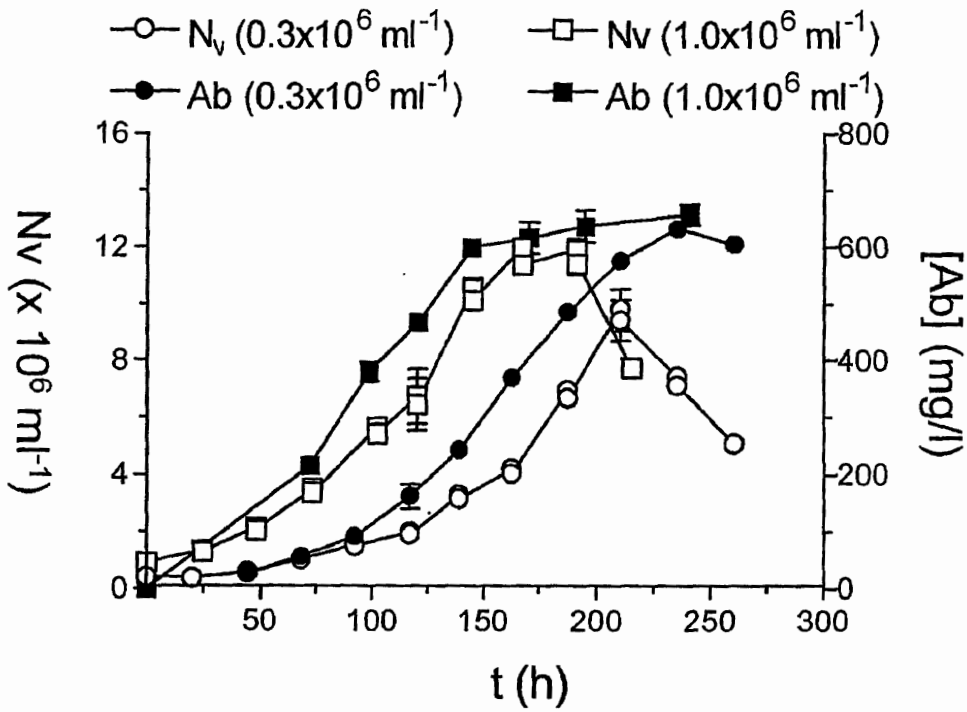

N$_v$ (0.3x10^6 ml^{-1})
Nv (1.0x10^6 ml^{-1})
Ab (0.3x10^6 ml^{-1})
Ab (1.0x10^6 ml^{-1})
Nv (x 10^6 ml^{-1})
[Ab] (mg/l)
t (h)
0
4
8
12
16
0
200
400
600
800
50
100
150
200
250
300

Fig. 2

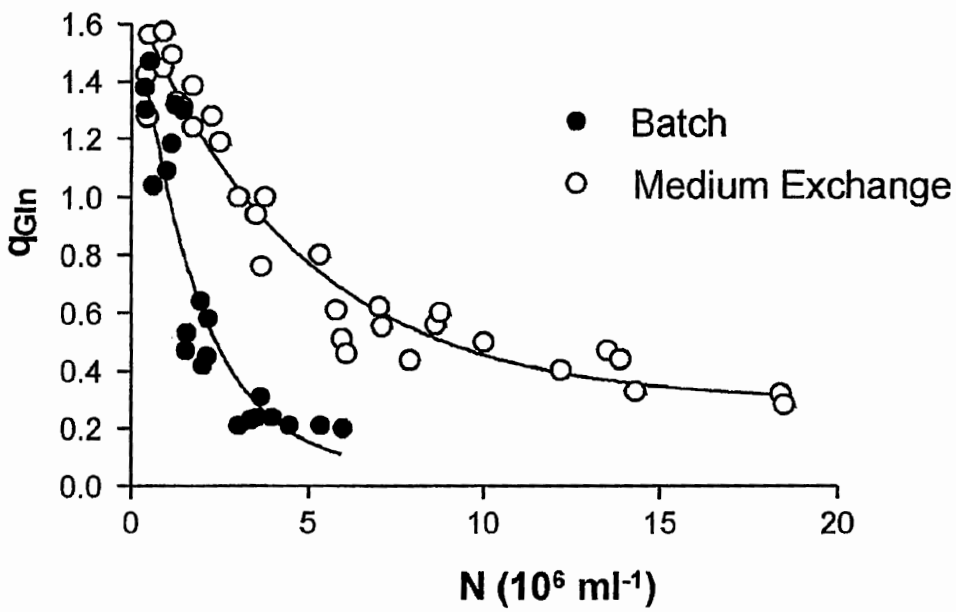

1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
q_{Gln}
0
5
10
15
20
N (10^6 ml^{-1})
Batch
Medium Exchange

Fig.3A

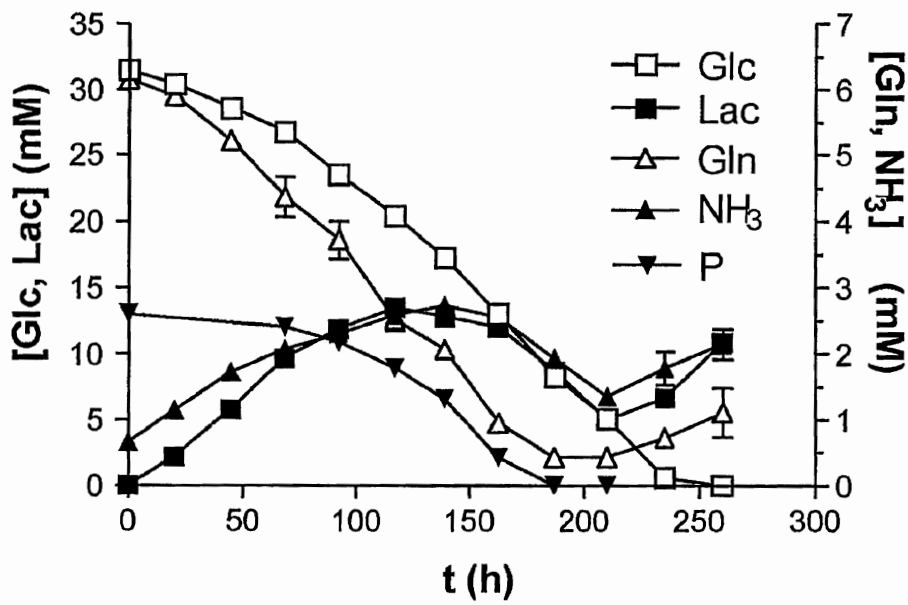

[Glc, Lac] (mM)
[Gln, NH3] (mM)
t (h)
Glc
Lac
Gln
NH3
P
0
5
10
15
20
25
30
35
0
1
2
3
4
5
6
7
0
50
100
150
200
250
300

Fig.3B

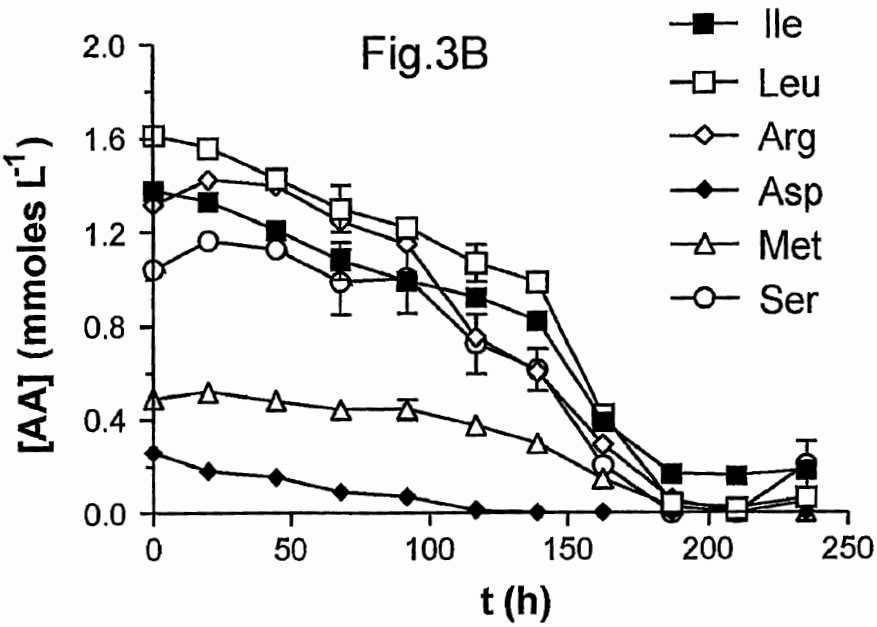

Ile
Leu
Arg
Asp
Met
Ser
[AA] (mmoles L-1)
2.0
1.6
1.2
0.8
0.4
0.0
0
50
100
150
200
250
t (h)

Fig.3C

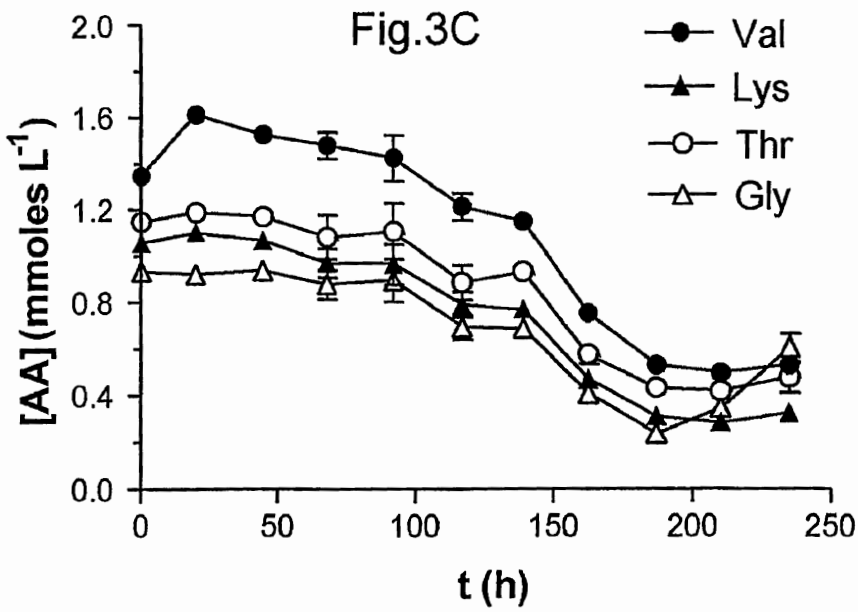

Val
Lys
Thr
Gly
[AA] (mmoles L-1)
2.0
1.6
1.2
0.8
0.4
0.0
0
50
100
150
200
250
t (h)

Fig.3D

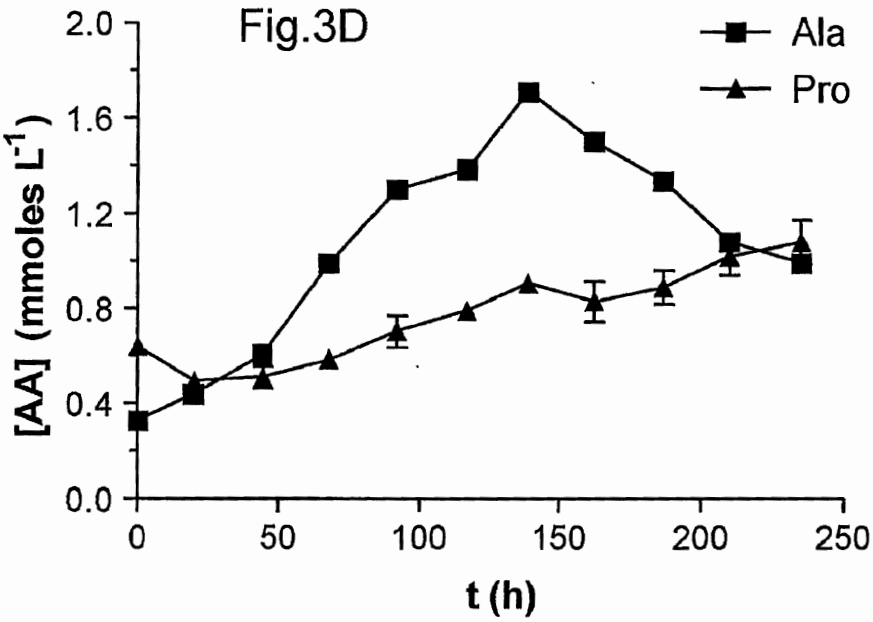

Ala
Pro
[AA] (mmoles L-1)
2.0
1.6
1.2
0.8
0.4
0.0
0
50
100
150
200
250
t (h)

Fig.3E

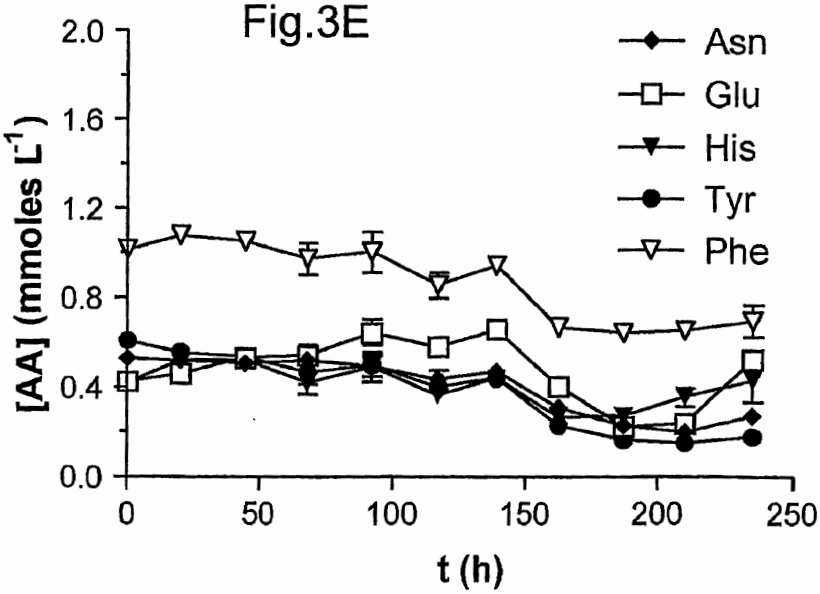

Asn
Glu
His
Tyr
Phe
[AA] (mmoles L-1)
2.0
1.6
1.2
0.8
0.4
0.0
0
50
100
150
200
250
t (h)

Fig. 4

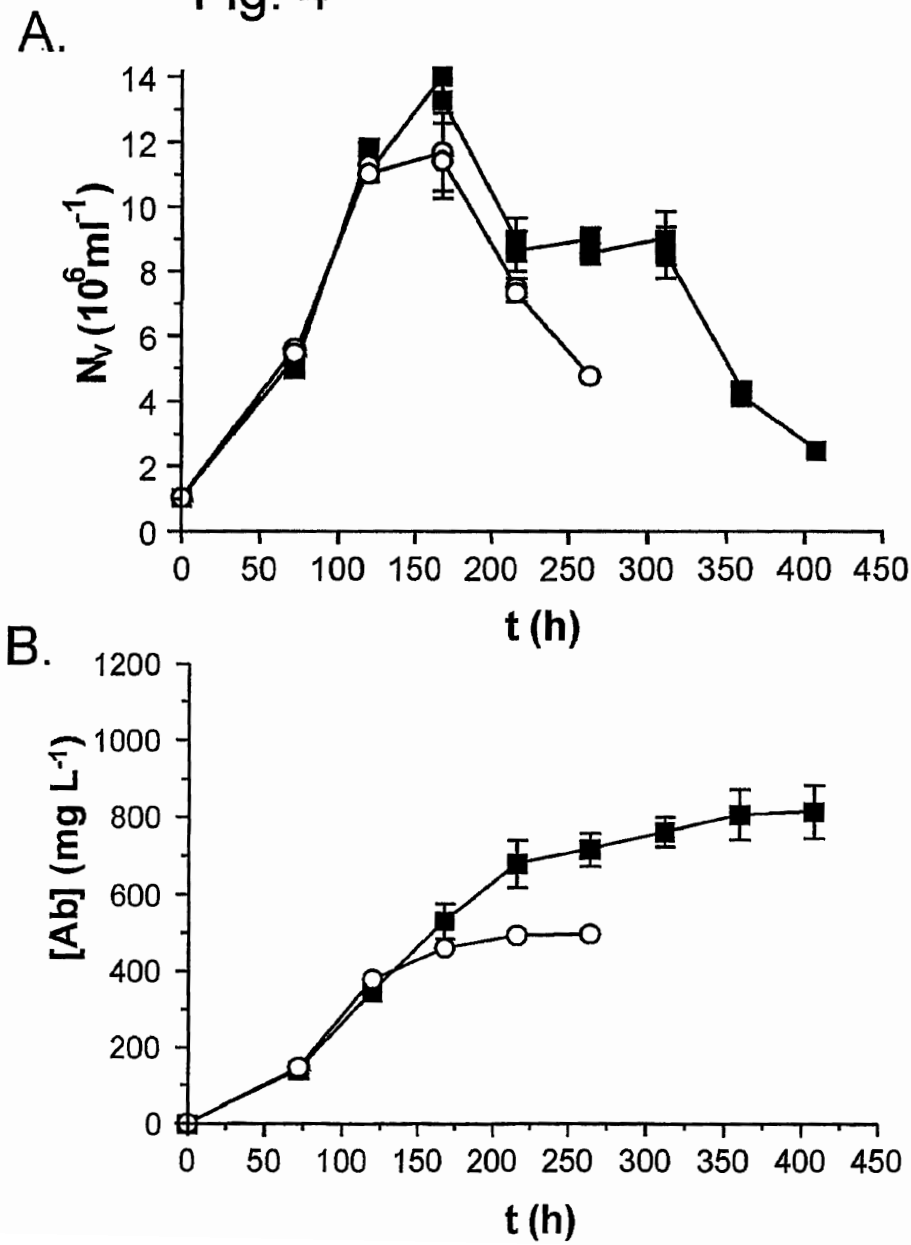

A.
N_V (10^6 ml^{-1})
0
2
4
6
8
10
12
14
0 50 100 150 200 250 300 350 400 450
t (h)
B.
[Ab] (mg L^{-1})
0
200
400
600
800
1000
1200
0 50 100 150 200 250 300 350 400 450
t (h)

Fig. 5

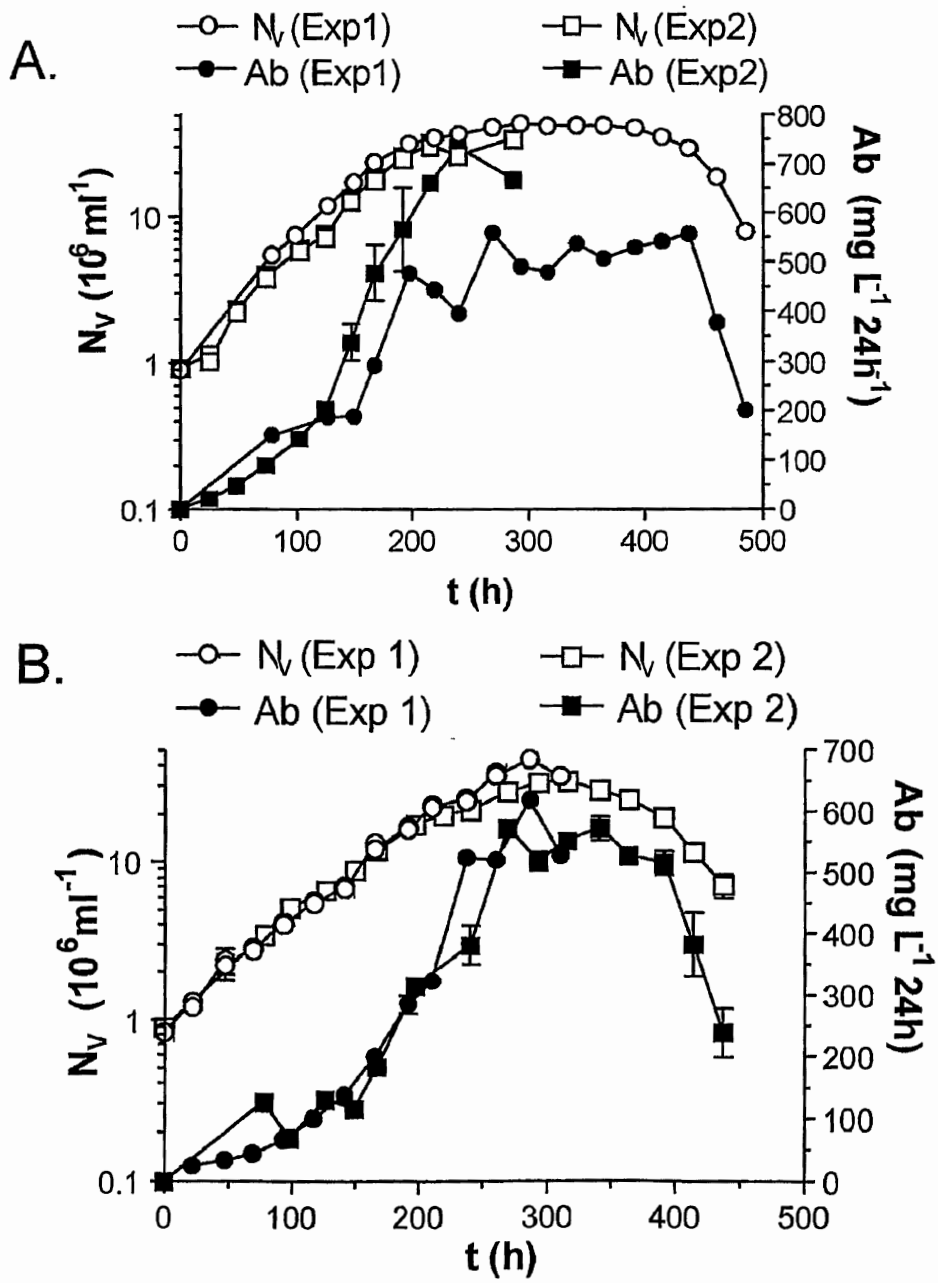
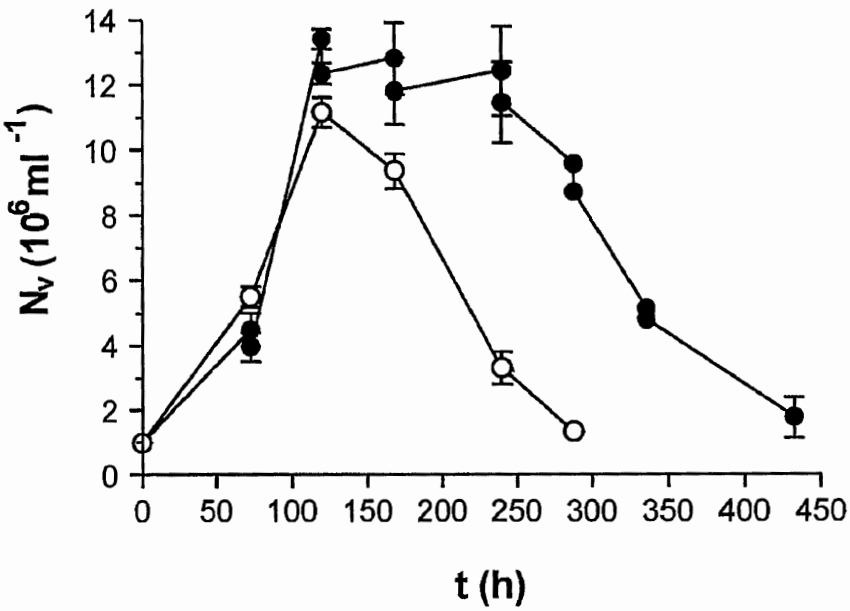

A.
N_V (Exp1)
N_V (Exp2)
Ab (Exp1)
Ab (Exp2)
N_V (10^6 ml^{-1})
Ab (mg L^{-1} $24h^{-1}$)
t (h)
B.
N_V (Exp 1)
N_V (Exp 2)
Ab (Exp 1)
Ab (Exp 2)
N_V (10^6 ml^{-1})
Ab (mg L^{-1} 24h)
t (h)

Fig. 6

A.


N_v (10^6ml^{-1})
0
2
4
6
8
10
12
14
0
50
100
150
200
250
300
350
400
450
t (h)

B.

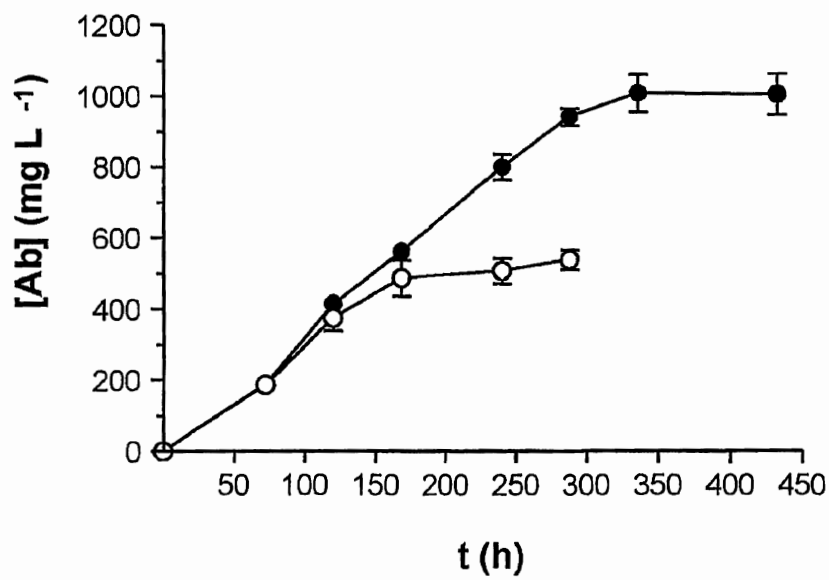

[Ab] (mg L^{-1})
0
200
400
600
800
1000
1200
50
100
150
200
250
300
350
400
450
t (h)

Fig. 7

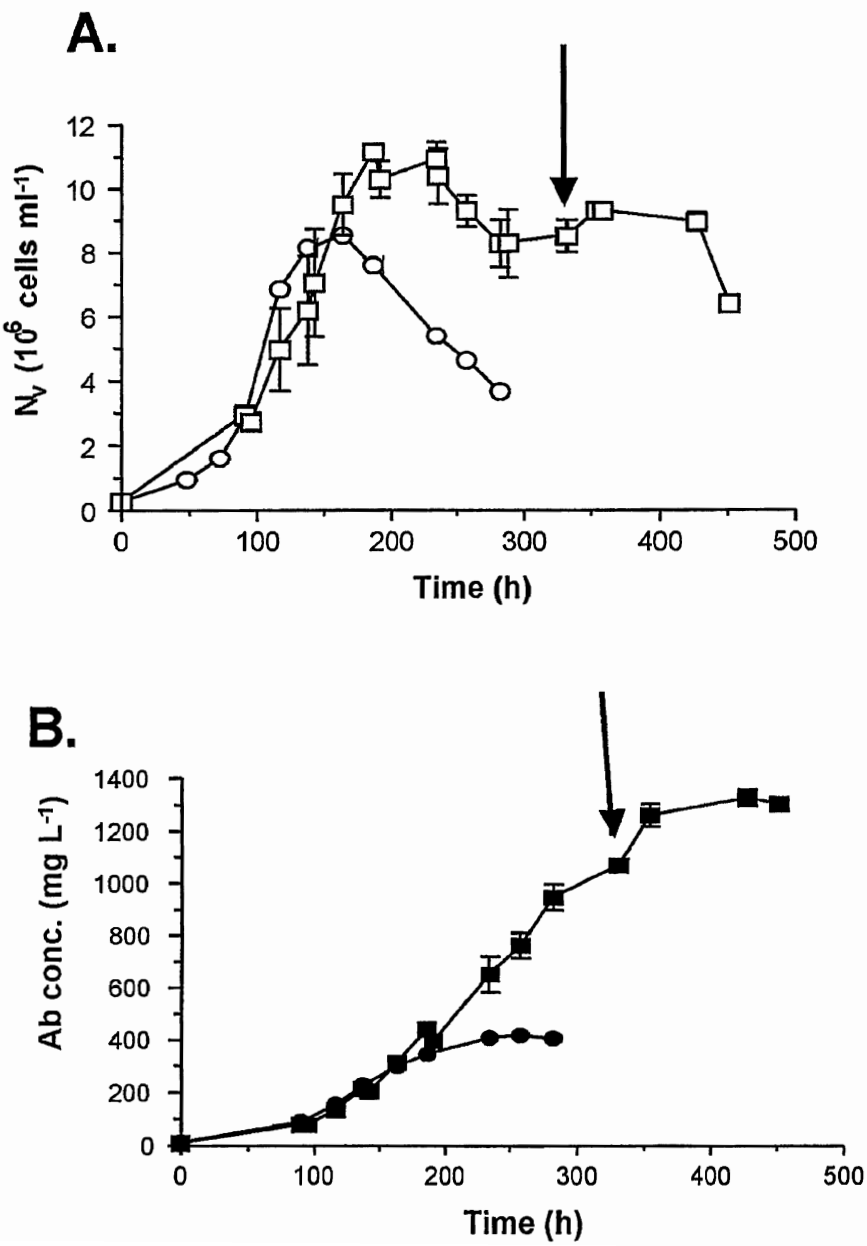

A.
N_v (10^6 cells ml^{-1})
0
2
4
6
8
10
12
0
100
200
300
400
500
Time (h)
B.
Ab conc. (mg L^{-1})
0
200
400
600
800
1000
1200
1400
0
100
200
300
400
500
Time (h)

Fig. 8

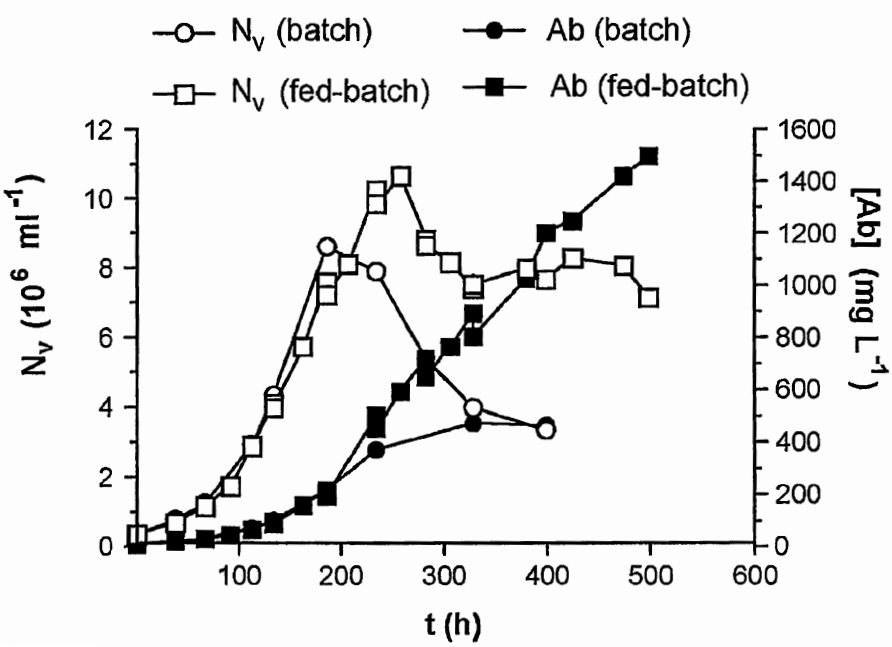

N$_v$ (batch)
Ab (batch)
N$_v$ (fed-batch)
Ab (fed-batch)
N$_v$ (10^6 ml^{-1})
[Ab] (mg L^{-1})
t (h)
0
2
4
6
8
10
12
0
200
400
600
800
1000
1200
1400
1600
100
200
300
400
500
600

Fig. 9

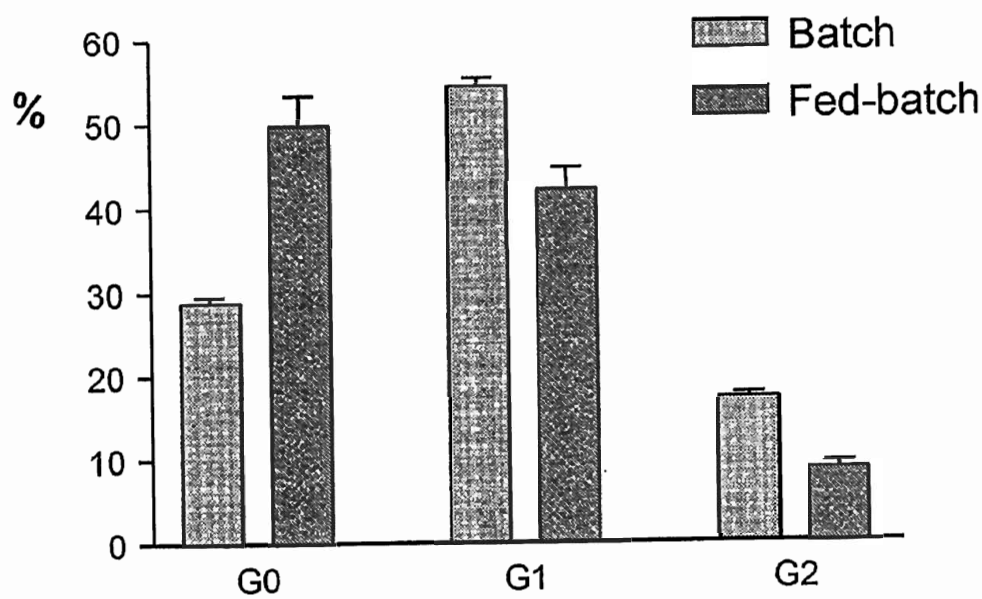
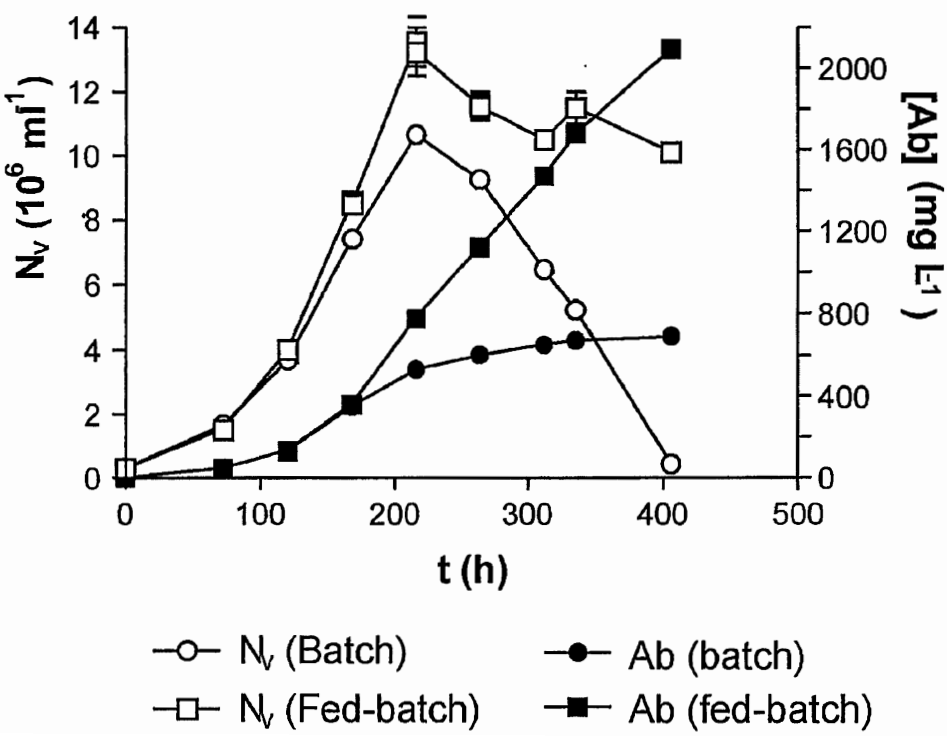


Fig. 10


14
12
10
8
6
4
2
0
N_v (10^6 ml^{-1})
0
100
200
300
400
500
t (h)
2000
1600
1200
800
400
0
[Ab] (mg L^{-1})
N_v (Batch)
N_v (Fed-batch)
Ab (batch)
Ab (fed-batch)