Fig. 1

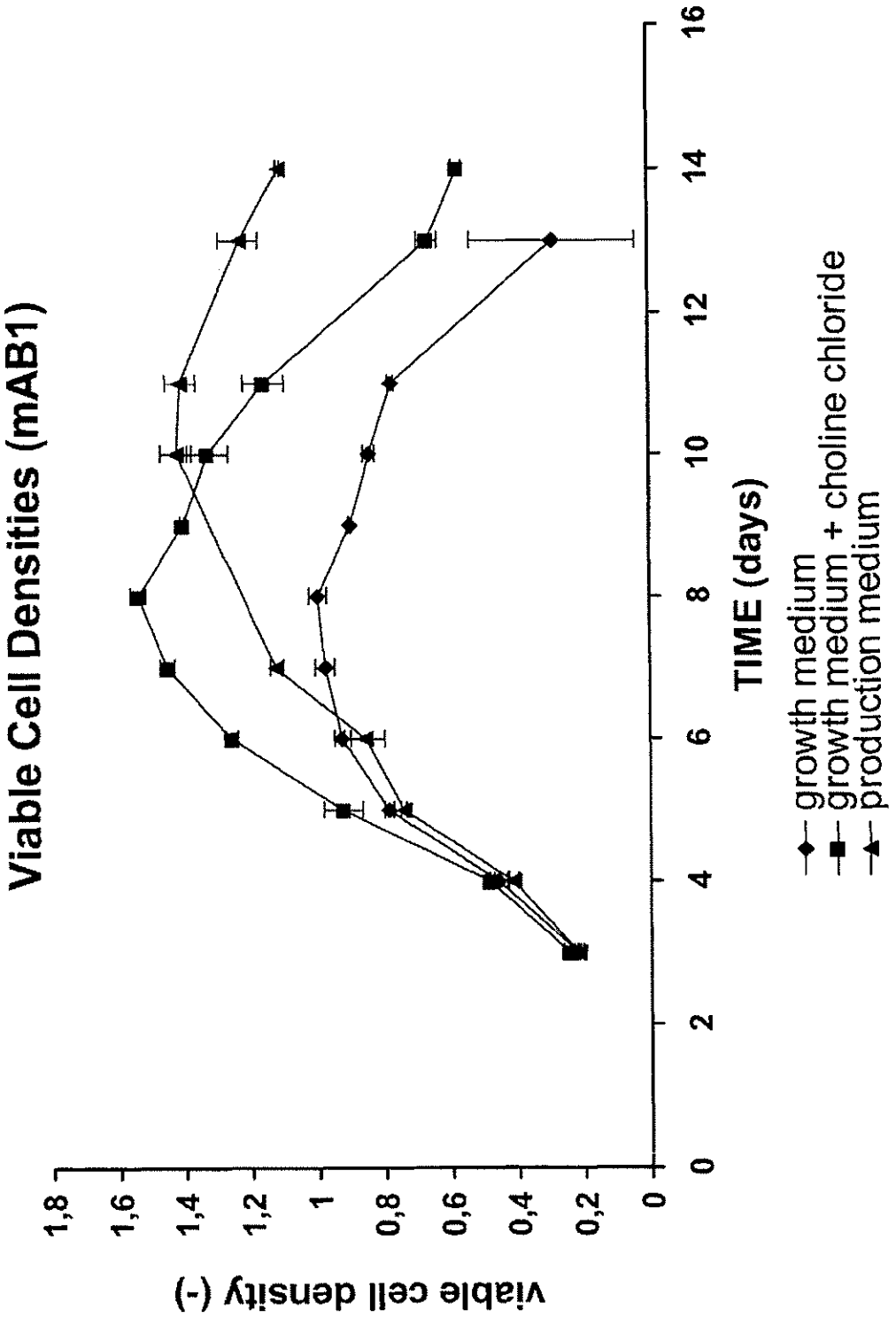

Viable Cell Densities (mAB1)
viable cell density (-)
TIME (days)
growth medium
growth medium + choline chloride
production medium
0
0,2
0,4
0,6
0,8
1
1,2
1,4
1,6
1,8
2
4
6
8
10
12
14
16

Fig. 2

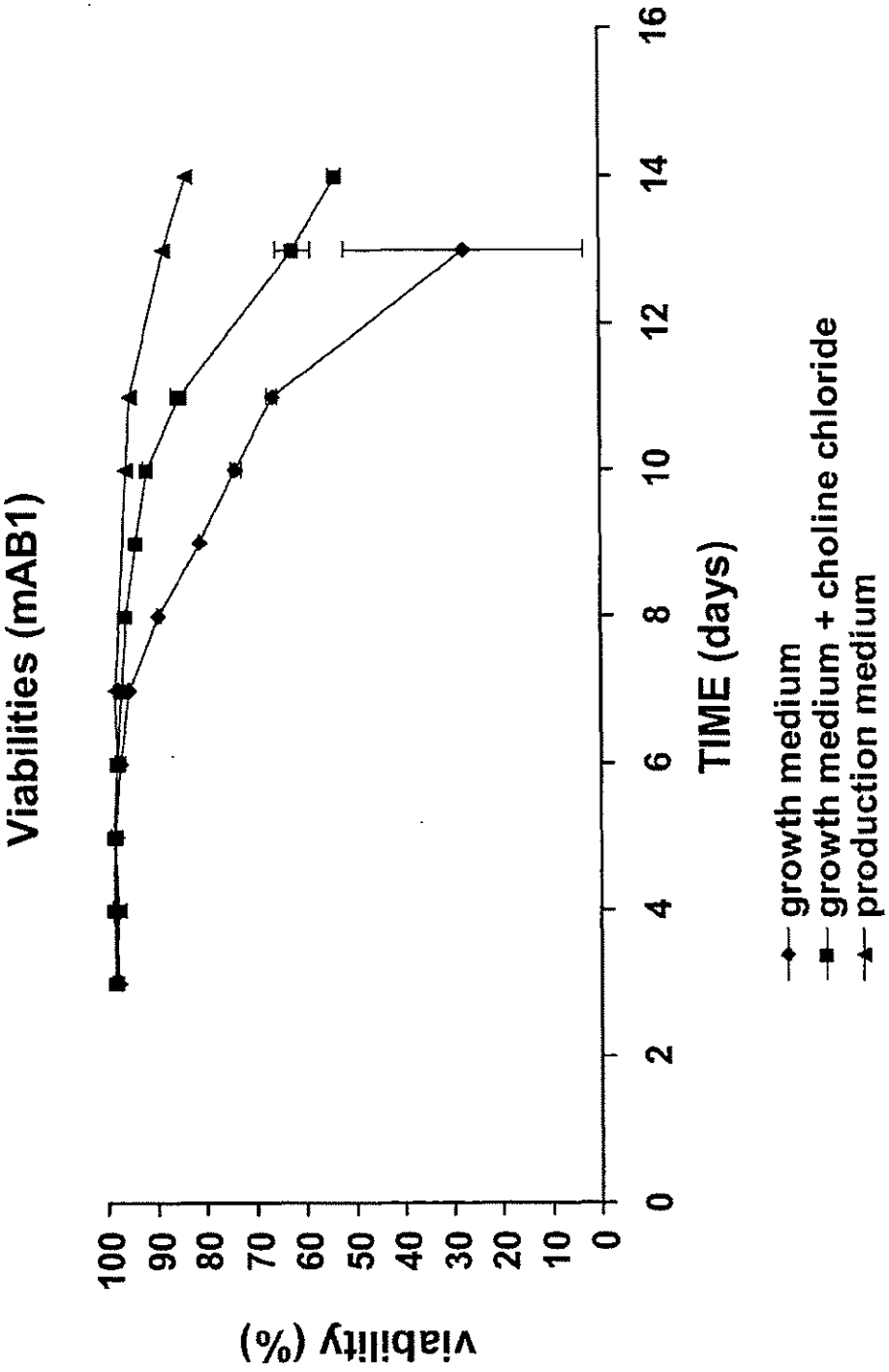

Viabilities (mAB1)
viability (%)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 3

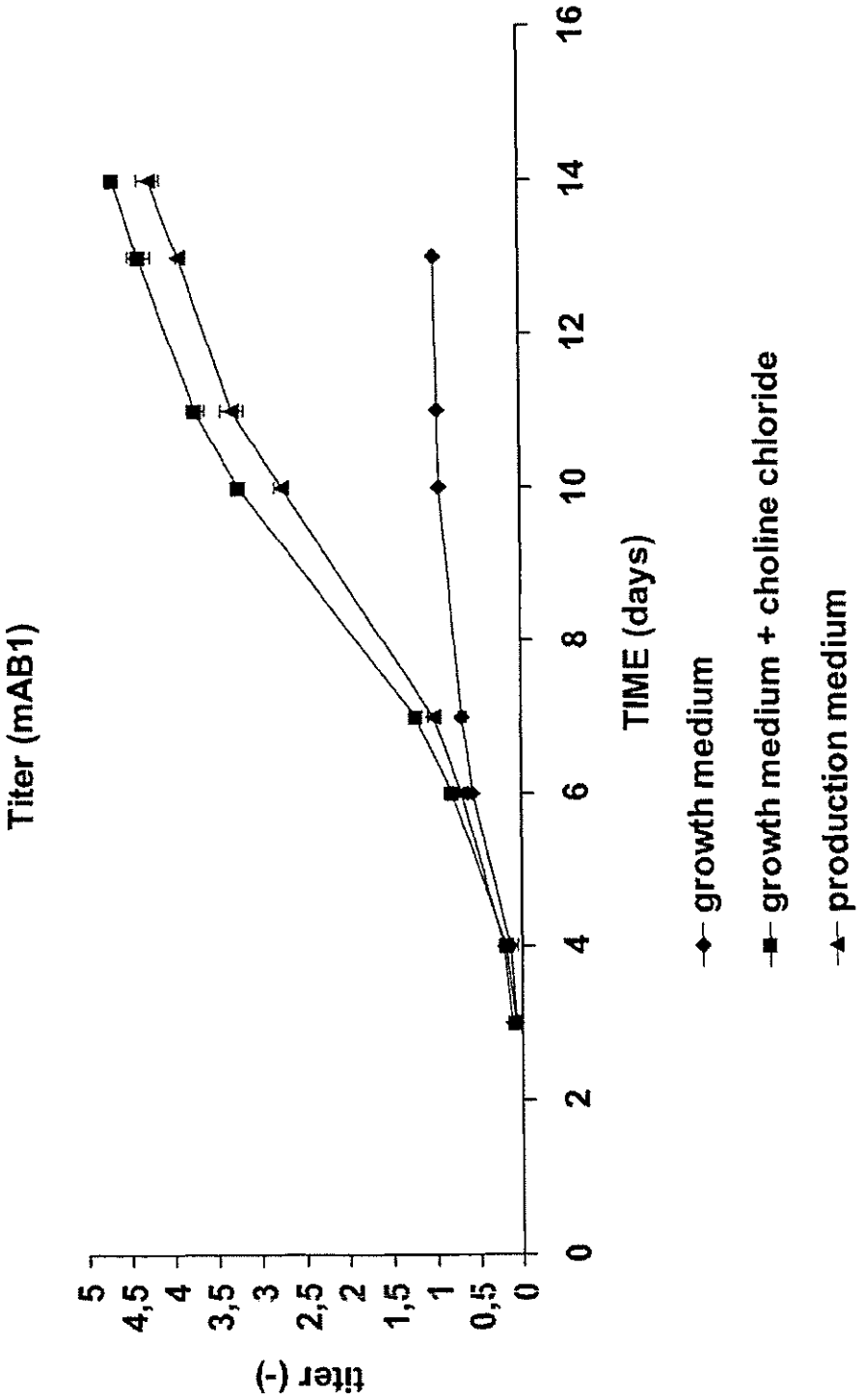

Titer (mAB1)
titer (-)
0
0,5
1
1,5
2
2,5
3
3,5
4
4,5
5
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 4

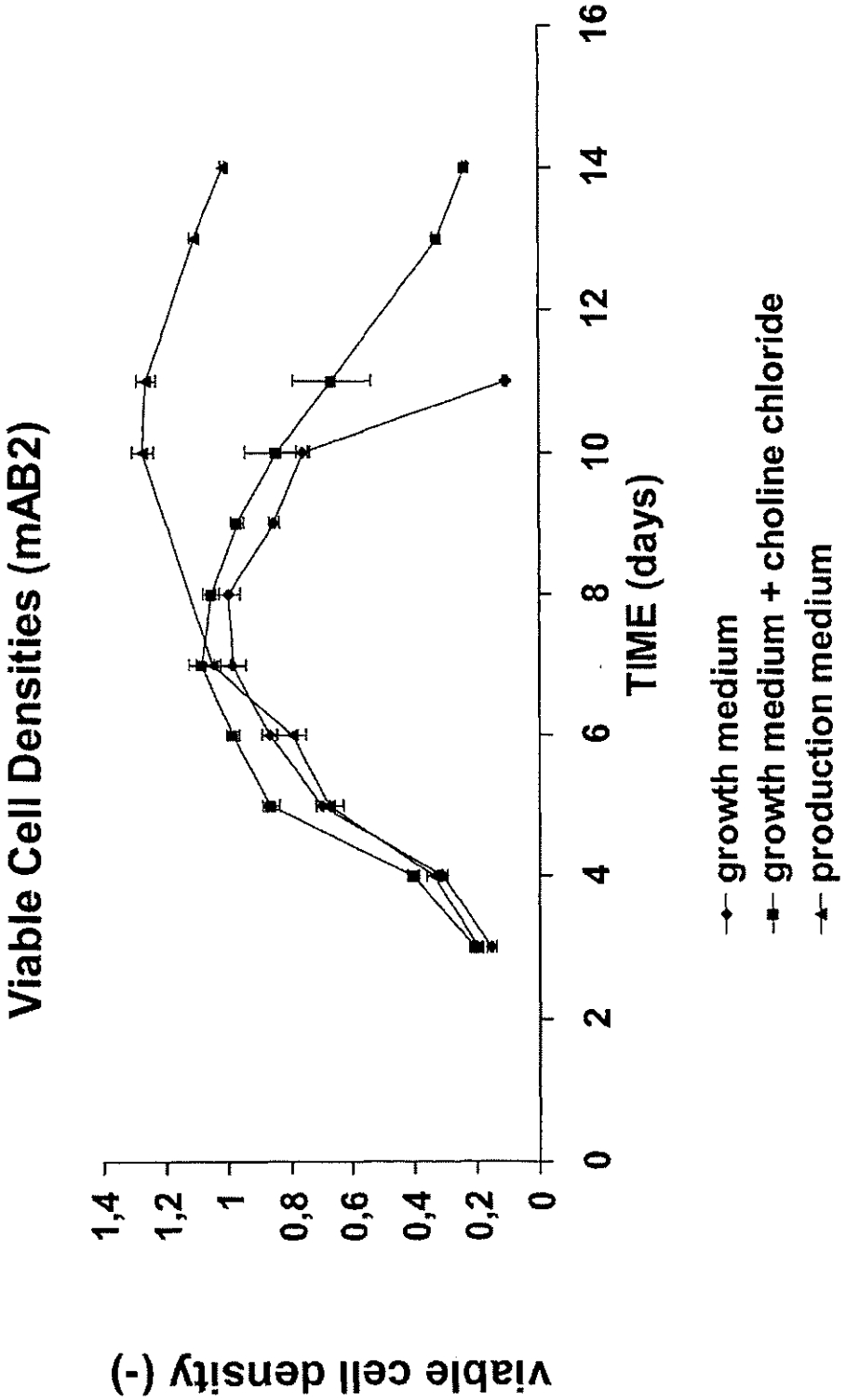

Viable Cell Densities (mAB2)
viable cell density (-)
1,4
1,2
1
0,8
0,6
0,4
0,2
0
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 5

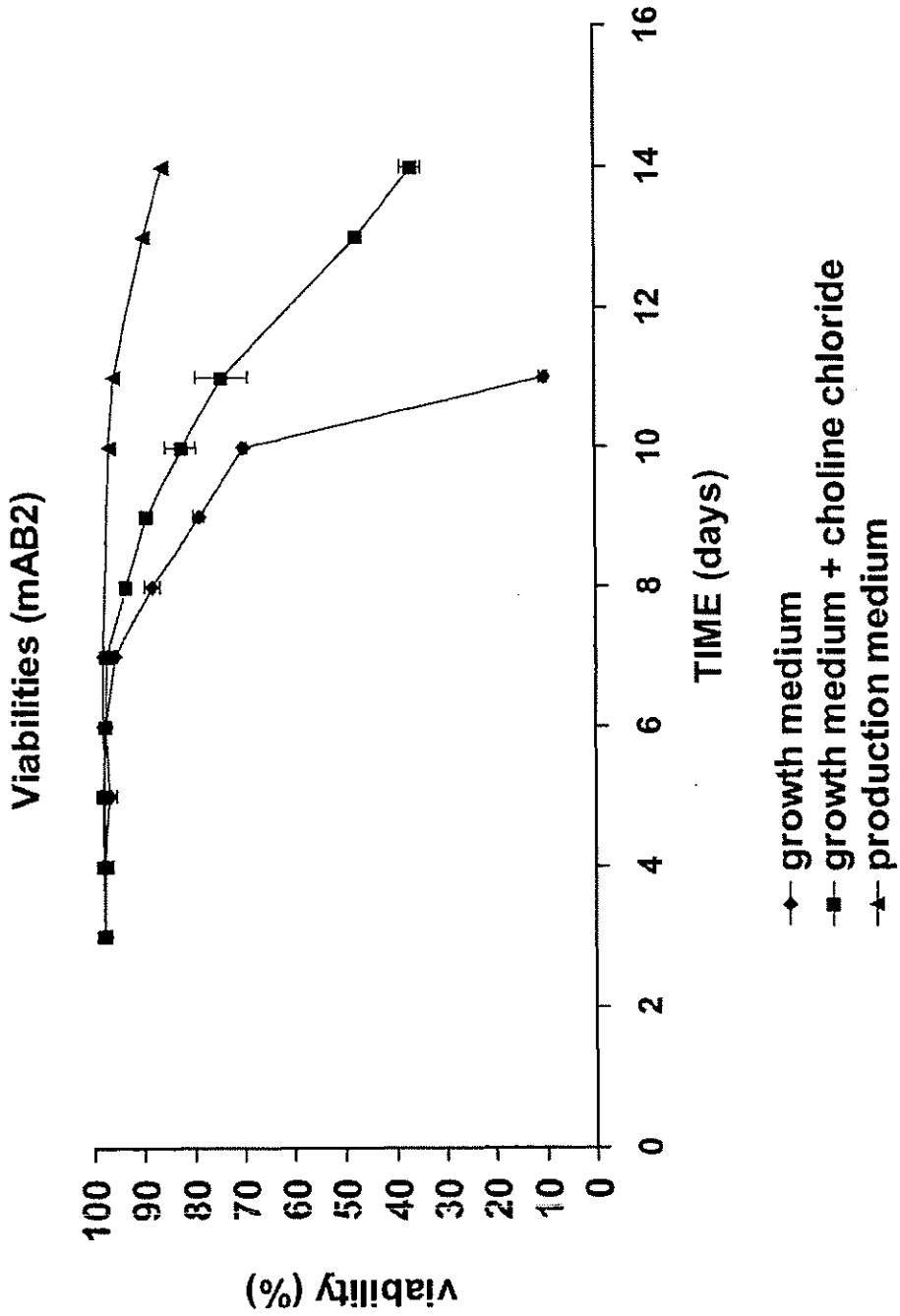

Viabilities (mAB2)
viability (%)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 6

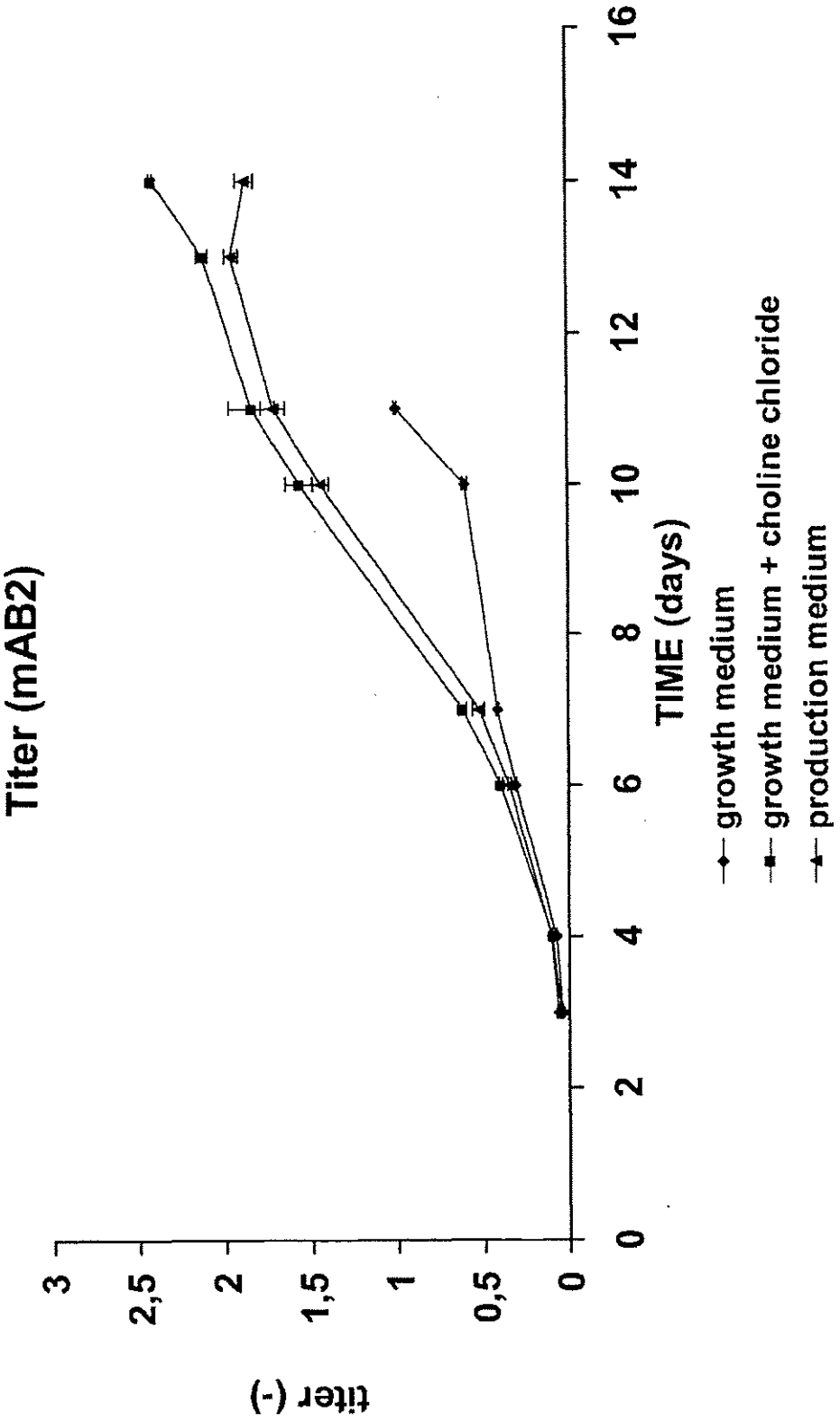

Titer (mAB2)
titer (-)
3
2,5
2
1,5
1
0,5
0
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 7

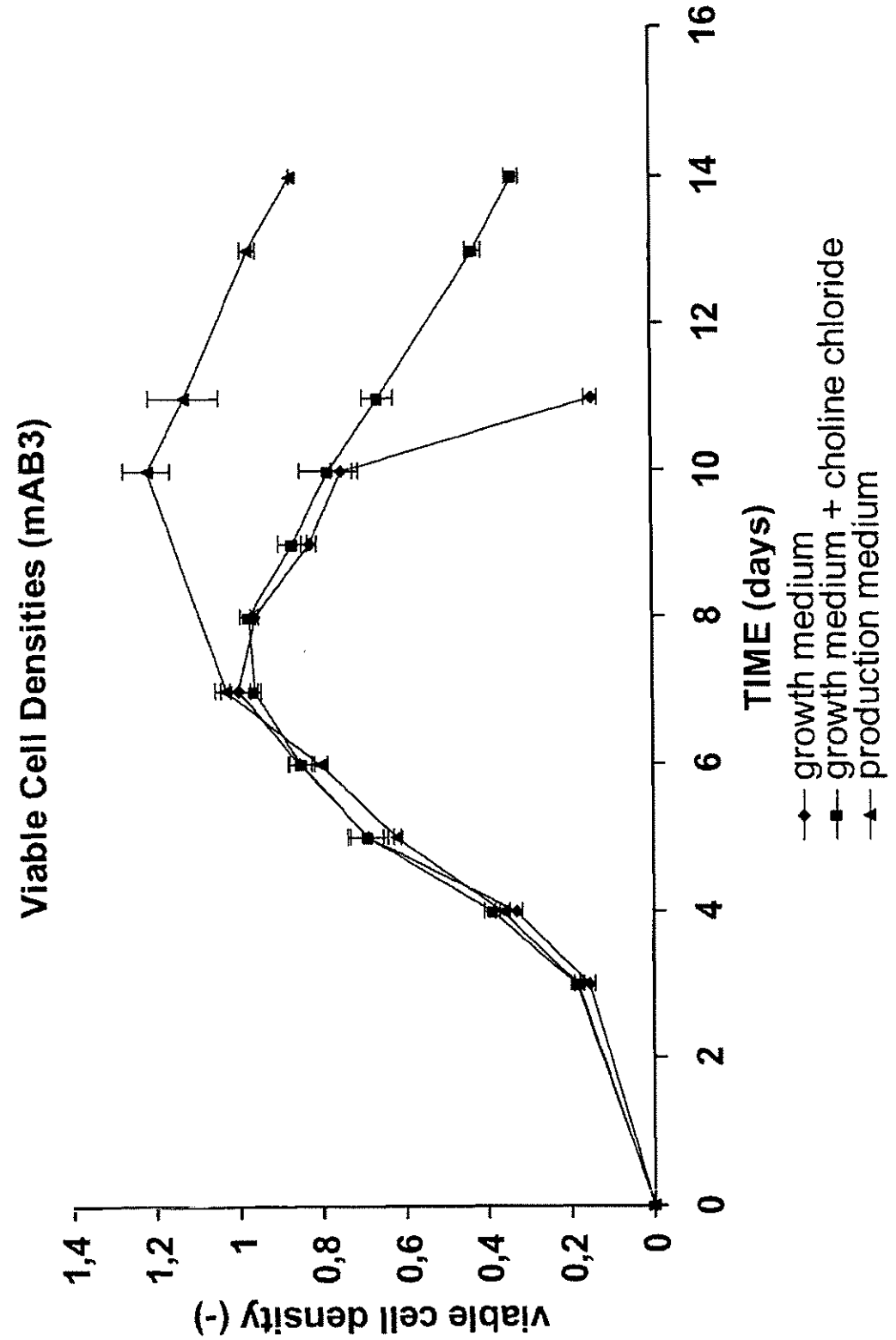

Viable Cell Densities (mAB3)
viable cell density (-)
0
0,2
0,4
0,6
0,8
1
1,2
1,4
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 8

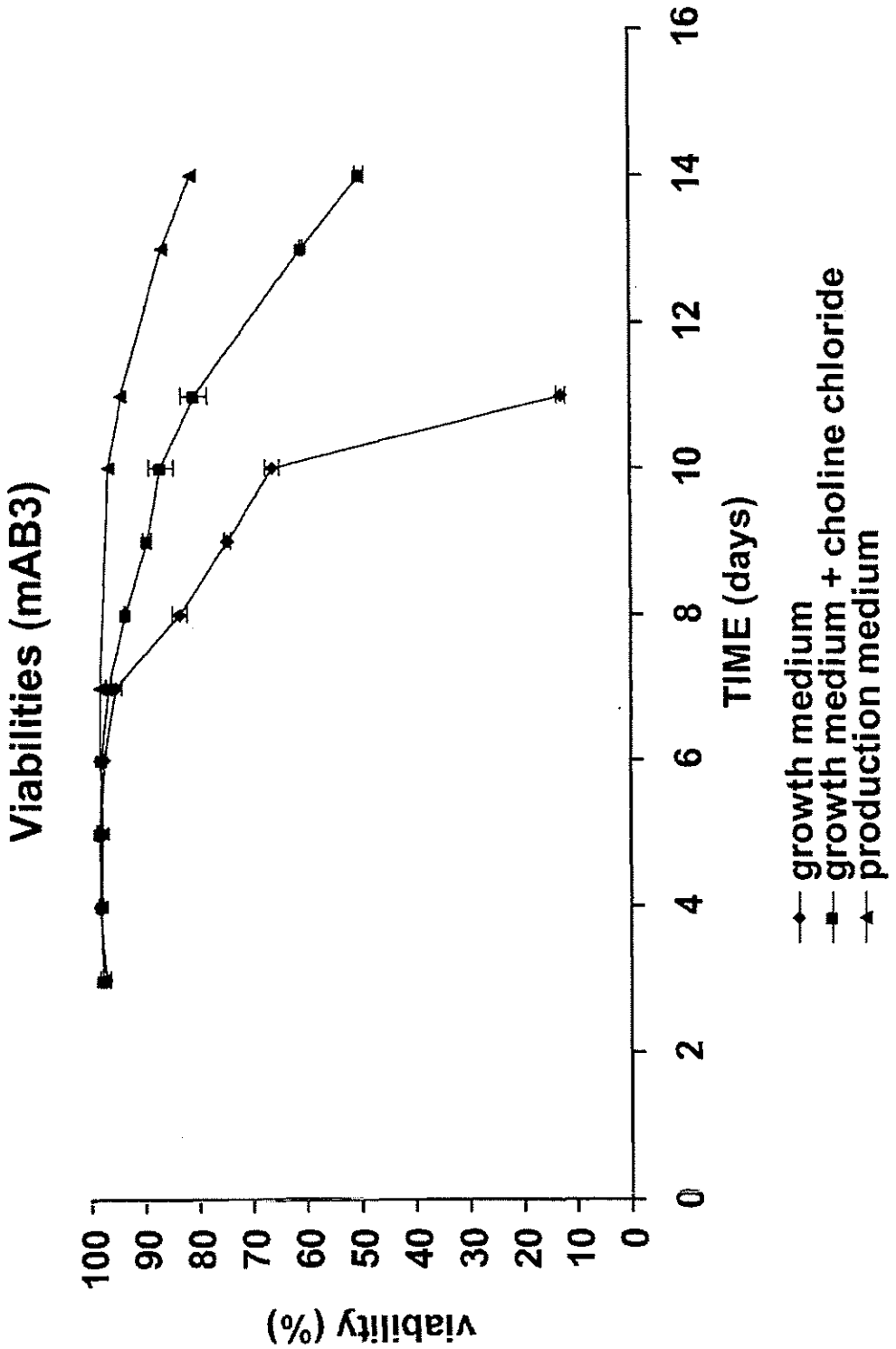

Viabilities (mAB3)
viability (%)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 9

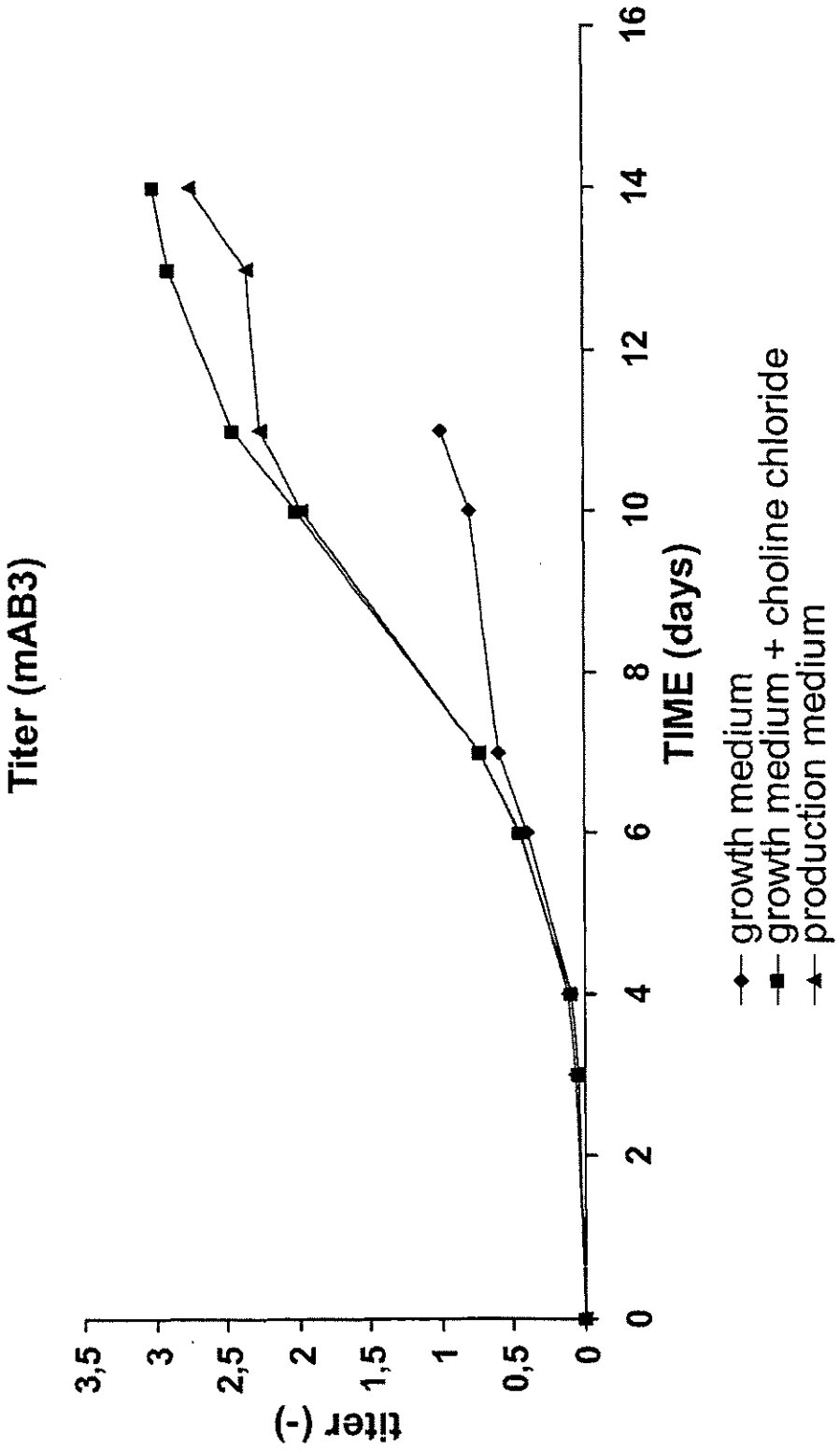

Titer (mAB3)
titer (-)
3,5
3
2,5
2
1,5
1
0,5
0
0
2
4
6
8
10
12
14
16
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 10

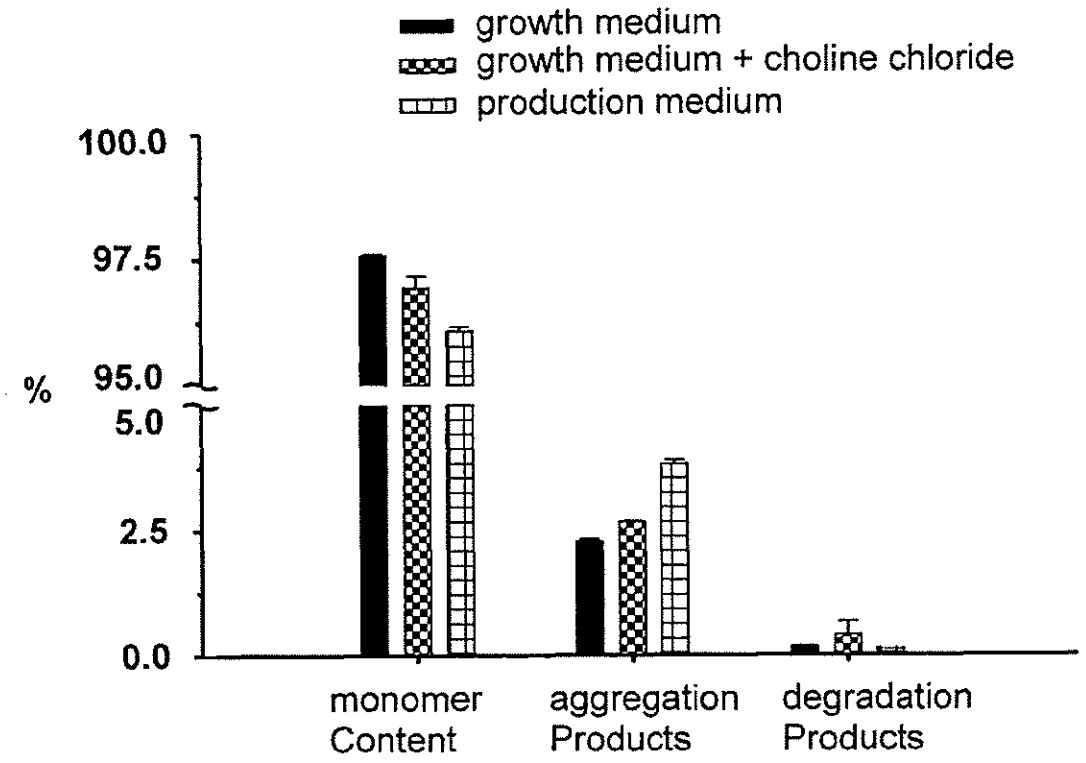

growth medium
growth medium + choline chloride
production medium
100.0
97.5
95.0
5.0
2.5
0.0
%
monomer Content
aggregation Products
degradation Products

Fig. 11

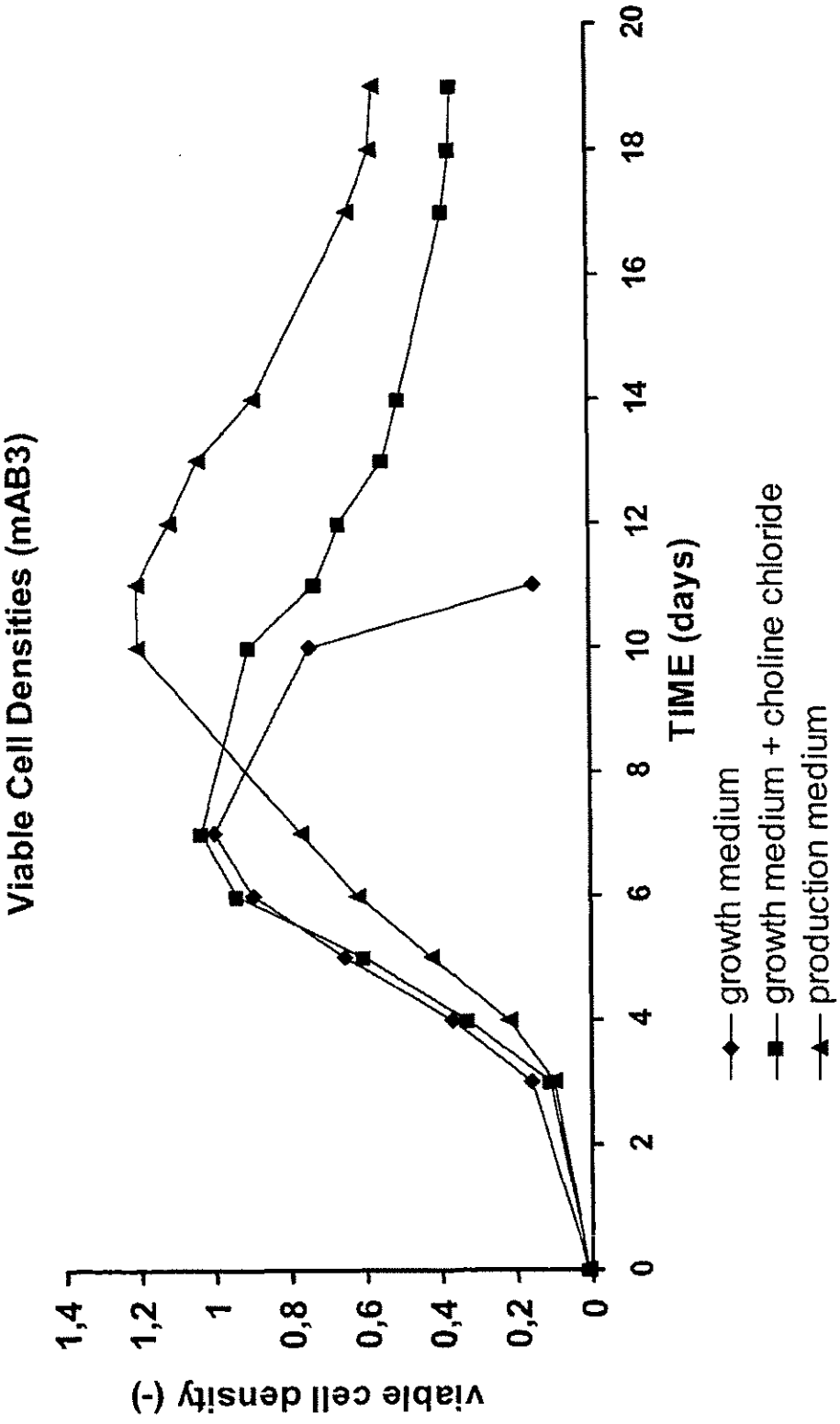

Viable Cell Densities (mAB3)
viable cell density (-)
1,4
1,2
1
0,8
0,6
0,4
0,2
0
0
2
4
6
8
10
12
14
16
18
20
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 12

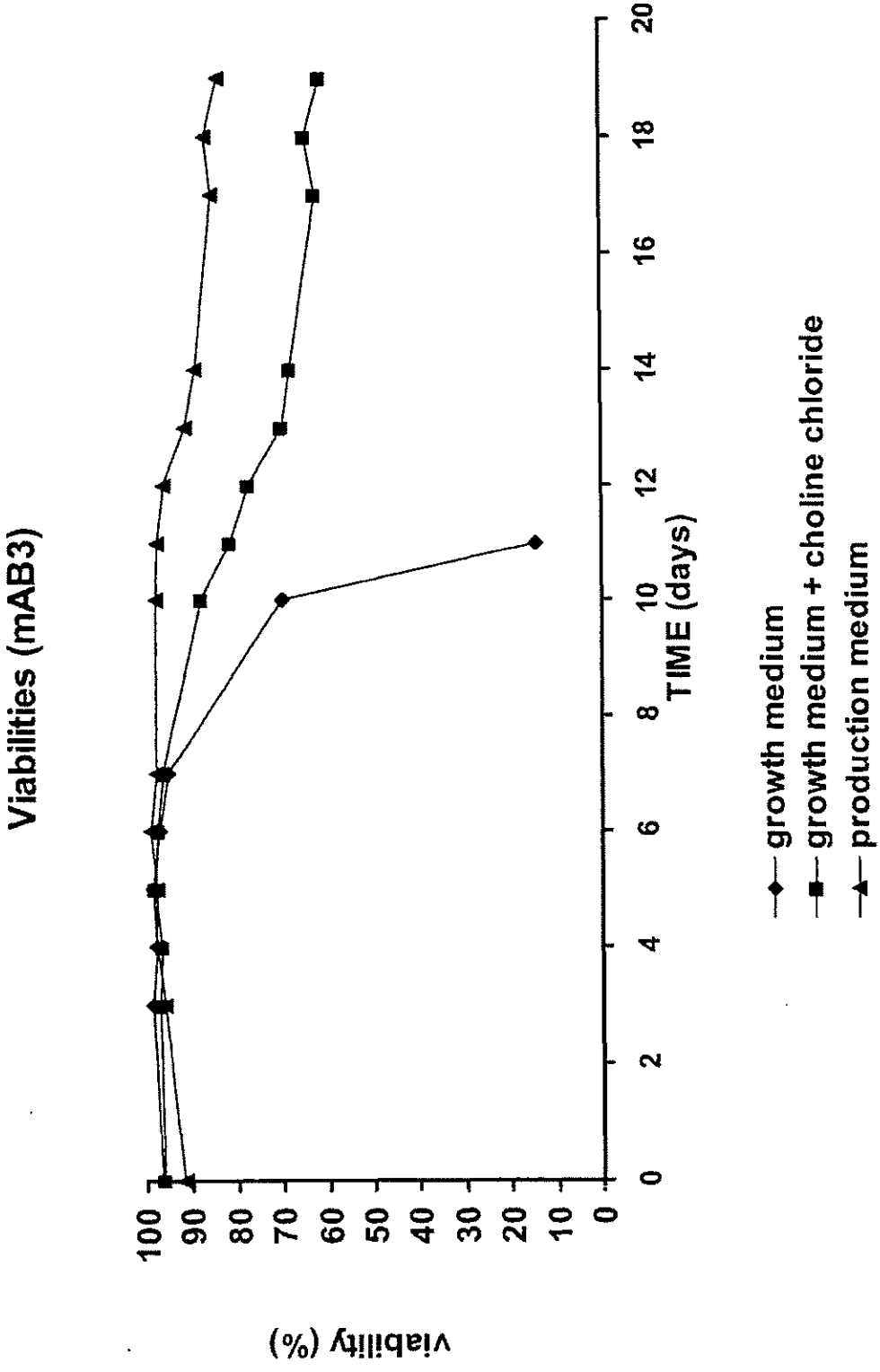

Viabilities (mAB3)
viability (%)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
TIME (days)
growth medium
growth medium + choline chloride
production medium

Fig. 13

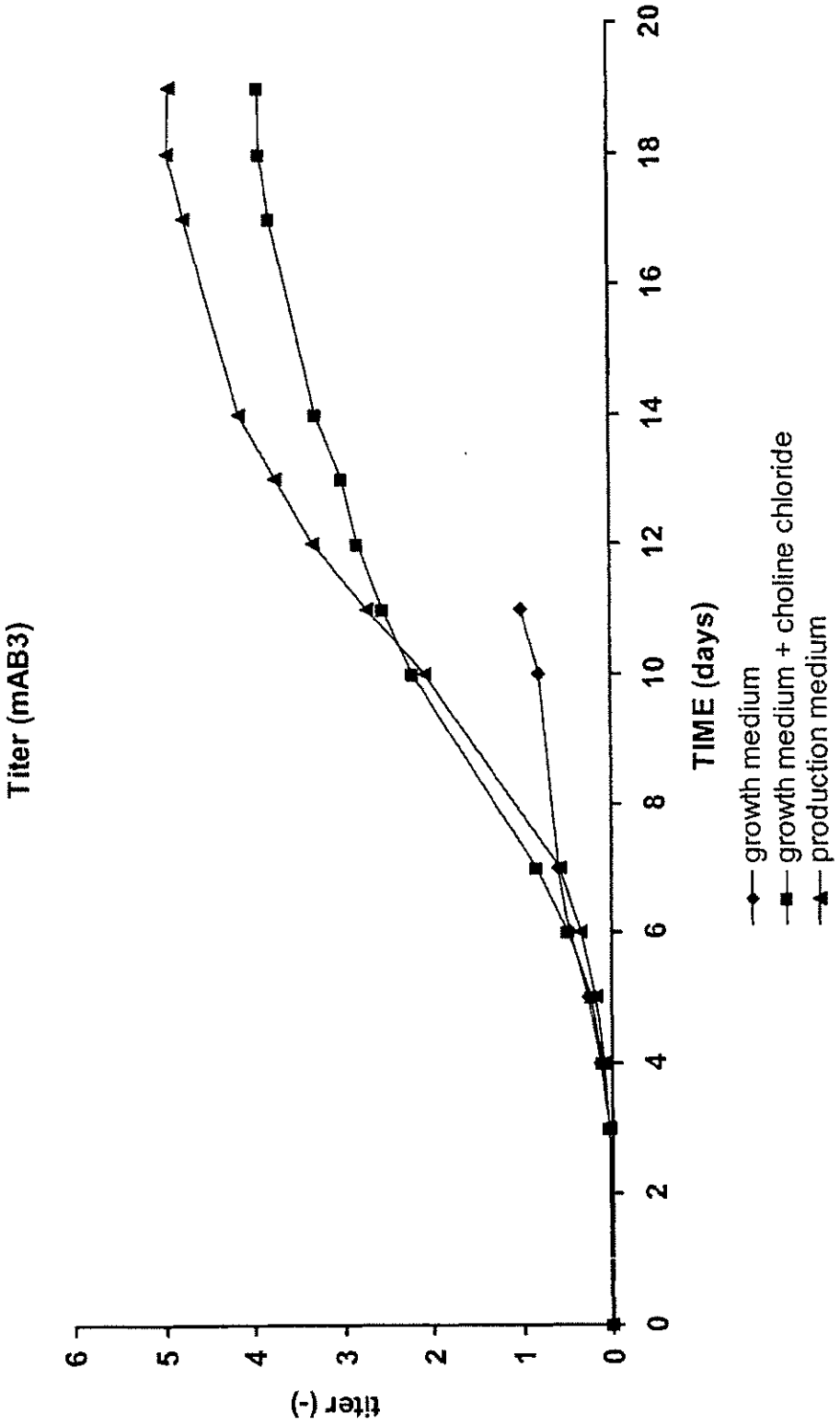

Titer (mAB3)
titer (-)
TIME (days)
growth medium
growth medium + choline chloride
production medium
0
1
2
3
4
5
6
0
2
4
6
8
10
12
14
16
18
20

Fig. 14

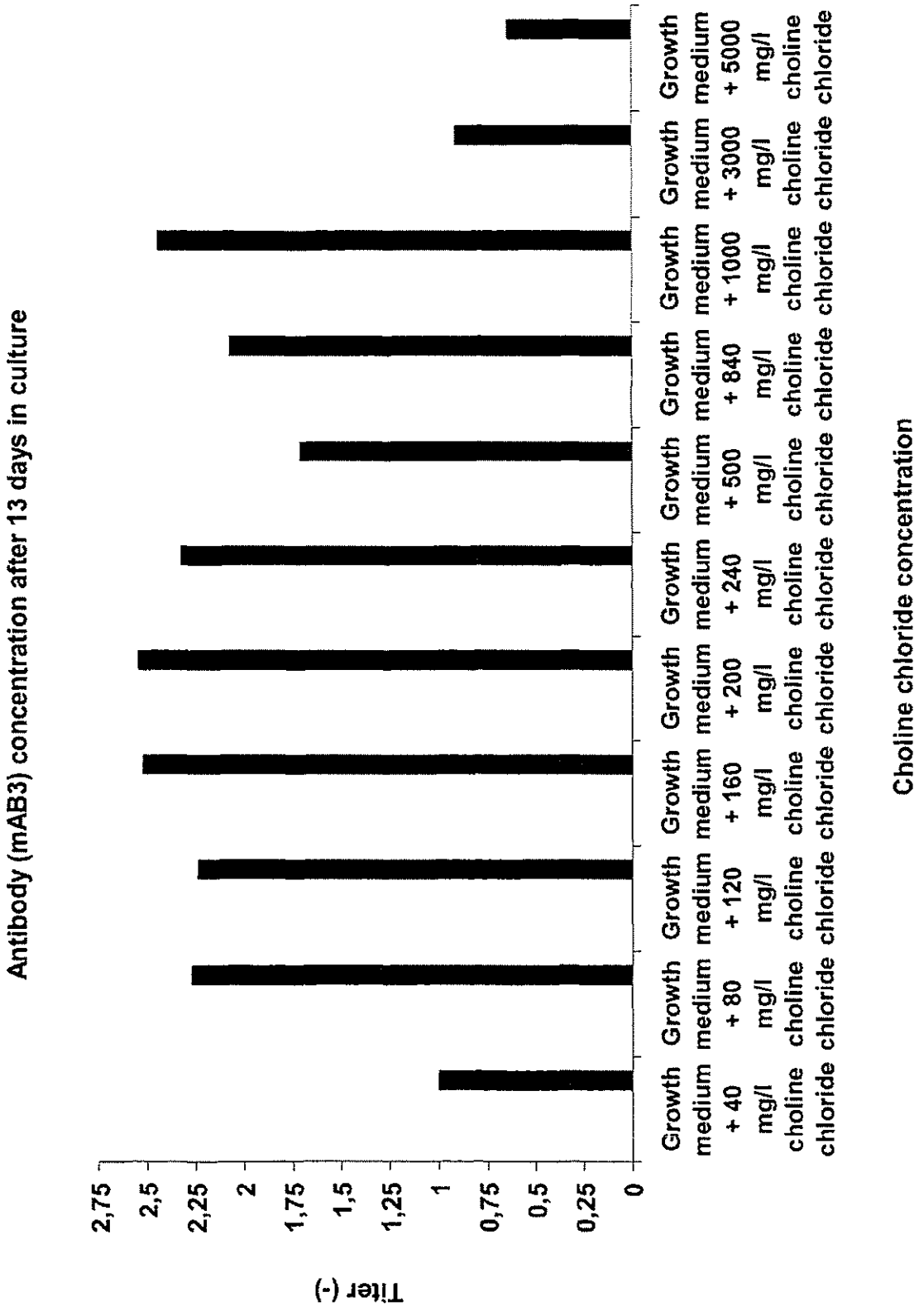

Antibody (mAB3) concentration after 13 days in culture
Titer (-)
2,75
2,5
2,25
2
1,75
1,5
1,25
1
0,75
0,5
0,25
0
Growth medium + 40 mg/l choline chloride
Growth medium + 80 mg/l choline chloride
Growth medium + 120 mg/l choline chloride
Growth medium + 160 mg/l choline chloride
Growth medium + 200 mg/l choline chloride
Growth medium + 240 mg/l choline chloride
Growth medium + 500 mg/l choline chloride
Growth medium + 840 mg/l choline chloride
Growth medium + 1000 mg/l choline chloride
Growth medium + 3000 mg/l choline chloride
Growth medium + 5000 mg/l choline chloride
Choline chloride concentration

Fig. 15

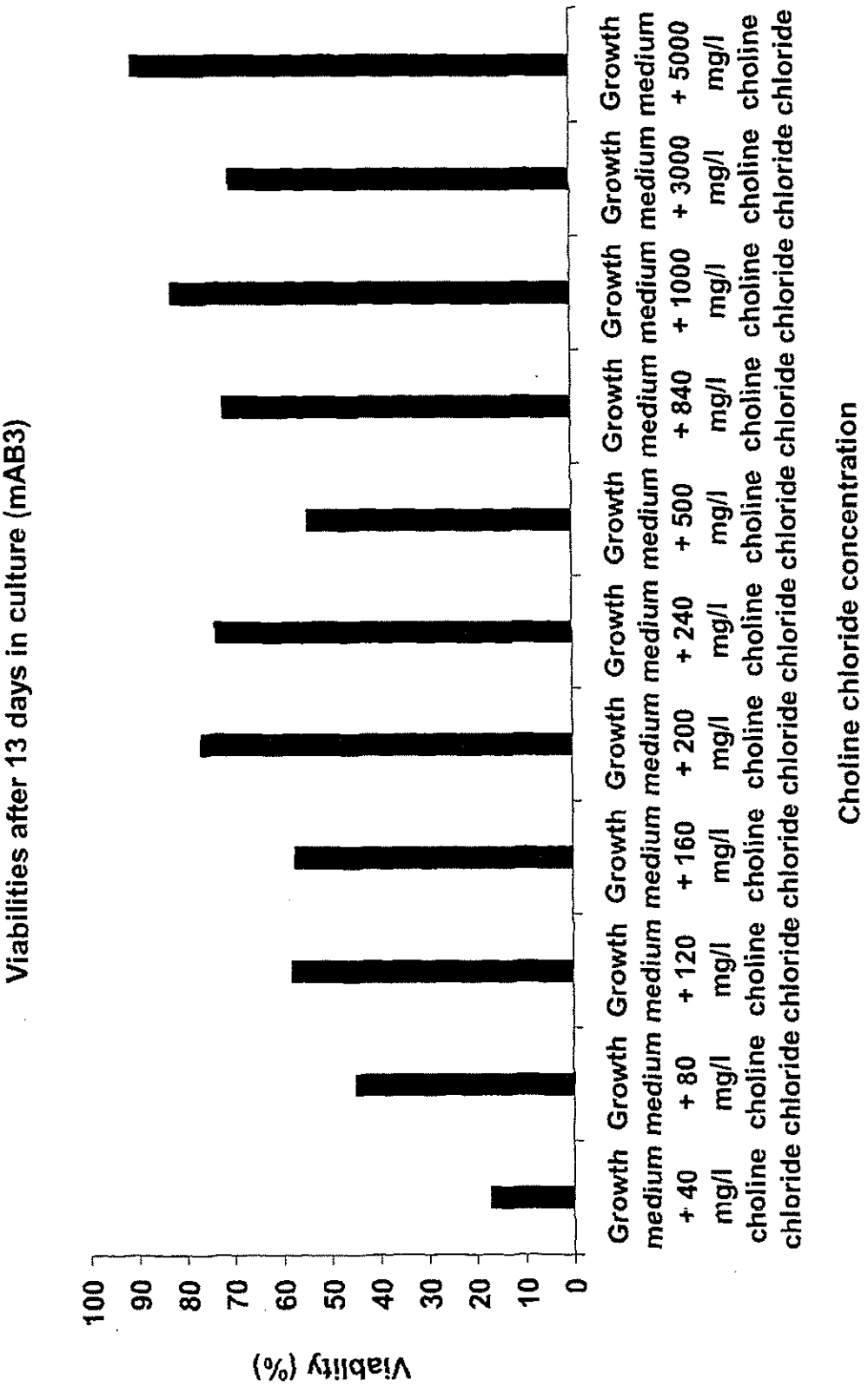

Viabilities after 13 days in culture (mAB3)
Viability (%)
100
90
80
70
60
50
40
30
20
10
0
Growth medium
Growth medium + 40 mg/l choline chloride
Growth medium + 80 mg/l choline chloride
Growth medium + 120 mg/l choline chloride
Growth medium + 160 mg/l choline chloride
Growth medium + 200 mg/l choline chloride
Growth medium + 240 mg/l choline chloride
Growth medium + 500 mg/l choline chloride
Growth medium + 840 mg/l choline chloride
Growth medium + 1000 mg/l choline chloride
Growth medium + 3000 mg/l choline chloride
Growth medium + 5000 mg/l choline chloride
Choline chloride concentration

Fig. 16

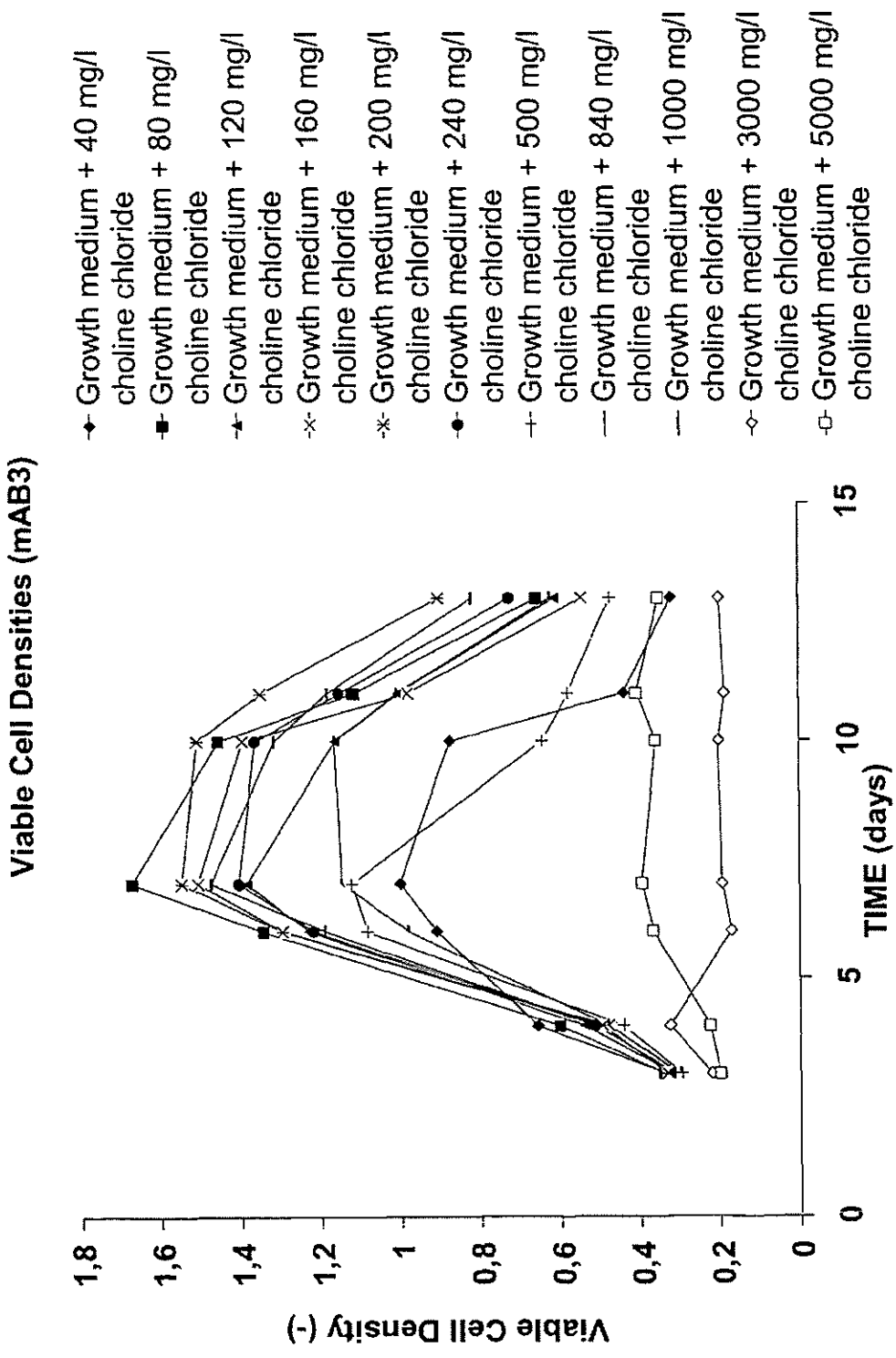

Viable Cell Densities (mAB3)
Growth medium + 40 mg/l choline chloride
Growth medium + 80 mg/l choline chloride
Growth medium + 120 mg/l choline chloride
Growth medium + 160 mg/l choline chloride
Growth medium + 200 mg/l choline chloride
Growth medium + 240 mg/l choline chloride
Growth medium + 500 mg/l choline chloride
Growth medium + 840 mg/l choline chloride
Growth medium + 1000 mg/l choline chloride
Growth medium + 3000 mg/l choline chloride
Growth medium + 5000 mg/l choline chloride
Viable Cell Density (-)
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
0
5
10
15
TIME (days)

Fig. 17

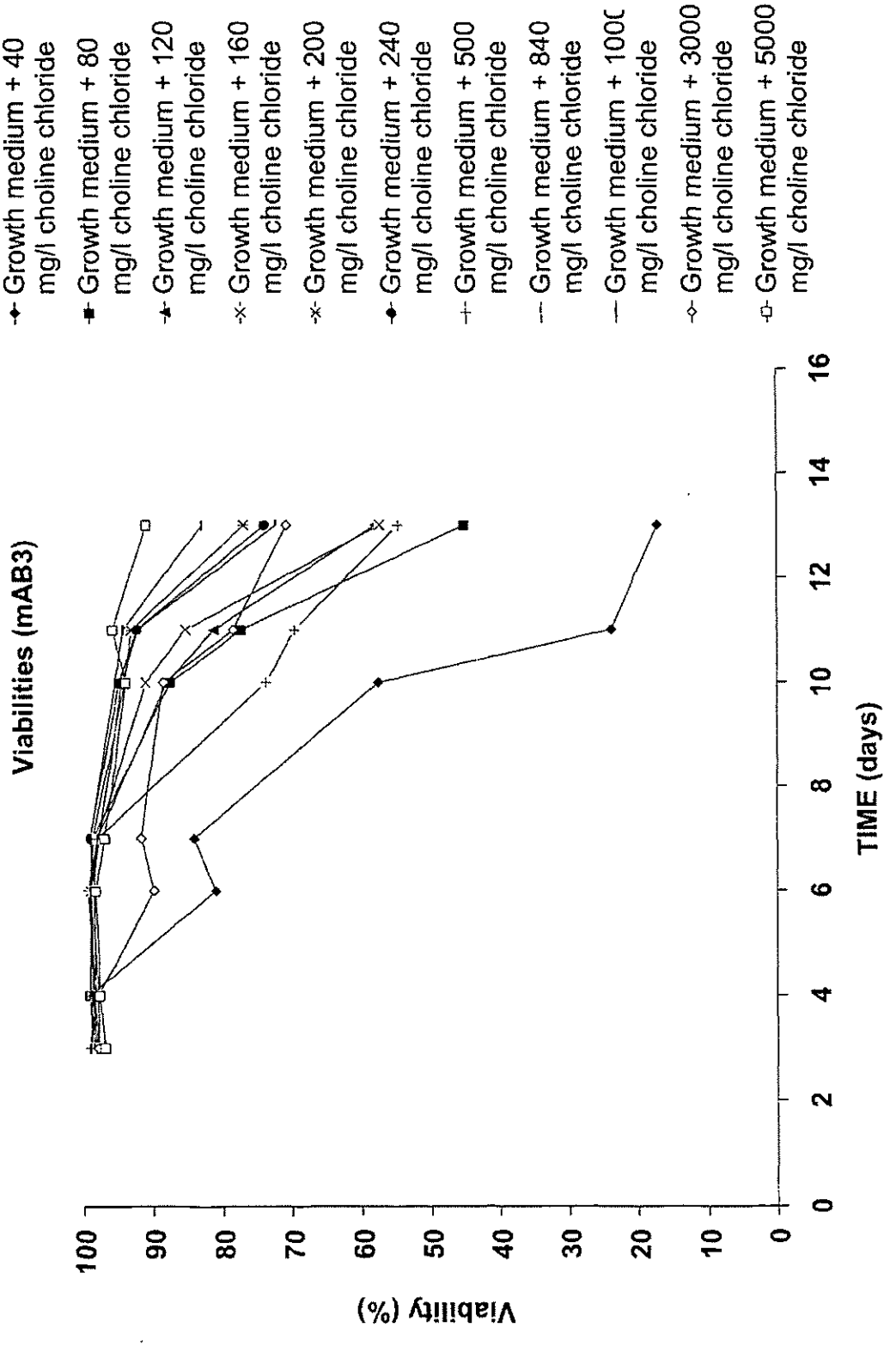

Growth medium + 40 mg/l choline chloride
Growth medium + 80 mg/l choline chloride
Growth medium + 120 mg/l choline chloride
Growth medium + 160 mg/l choline chloride
Growth medium + 200 mg/l choline chloride
Growth medium + 240 mg/l choline chloride
Growth medium + 500 mg/l choline chloride
Growth medium + 840 mg/l choline chloride
Growth medium + 100(mg/l choline chloride
Growth medium + 3000 mg/l choline chloride
Growth medium + 5000 mg/l choline chloride
Viabilities (mAB3)
Viability (%)
TIME (days)
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14
16

Fig. 18

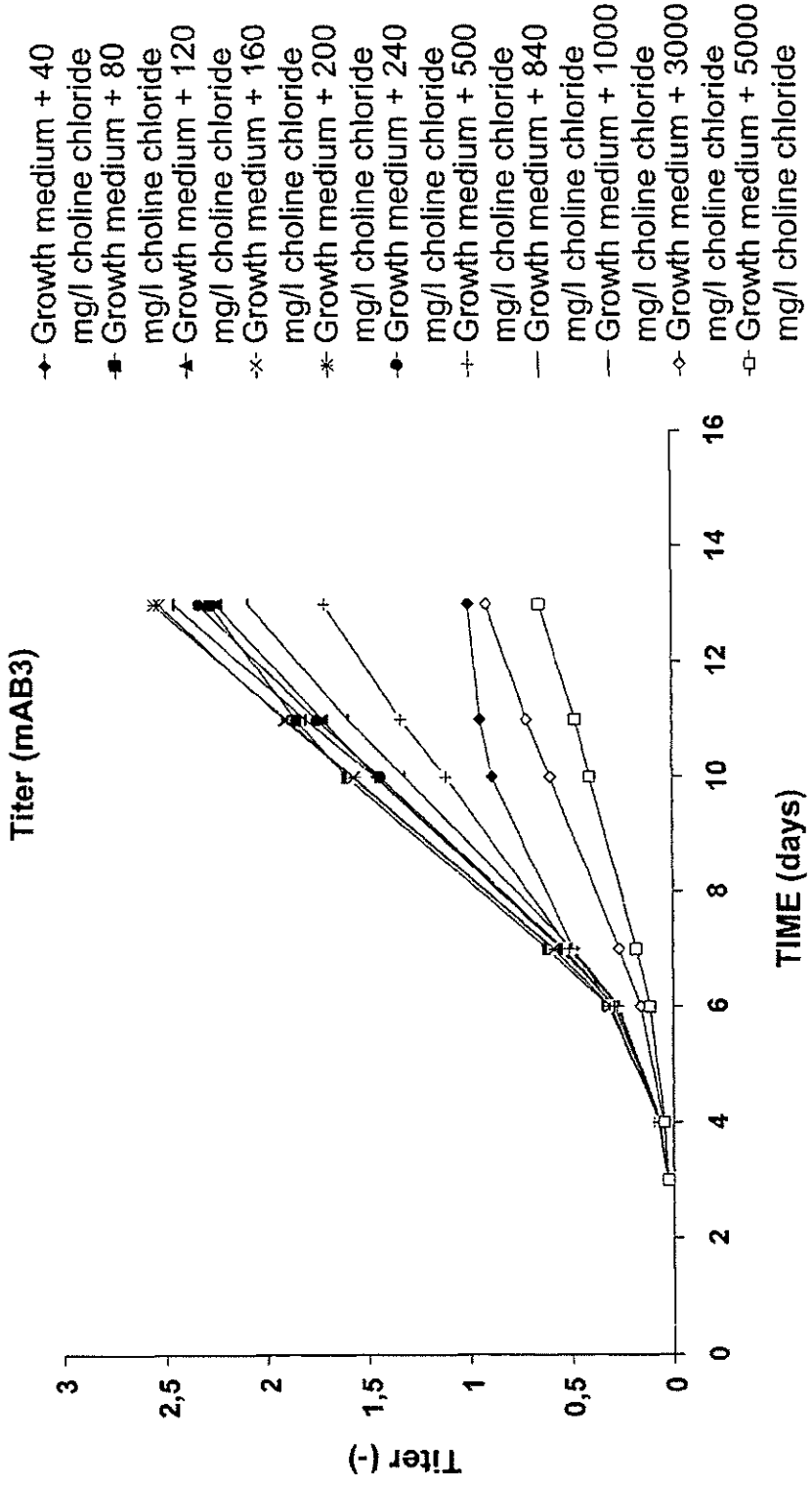

Growth medium + 40 mg/l choline chloride
Growth medium + 80 mg/l choline chloride
Growth medium + 120 mg/l choline chloride
Growth medium + 160 mg/l choline chloride
Growth medium + 200 mg/l choline chloride
Growth medium + 240 mg/l choline chloride
Growth medium + 500 mg/l choline chloride
Growth medium + 840 mg/l choline chloride
Growth medium + 1000 mg/l choline chloride
Growth medium + 3000 mg/l choline chloride
Growth medium + 5000 mg/l choline chloride
Titer (mAB3)
TIME (days)
Titer (-)
0
2
4
6
8
10
12
14
16
0
0,5
1
1,5
2
2,5
3

Fig. 19

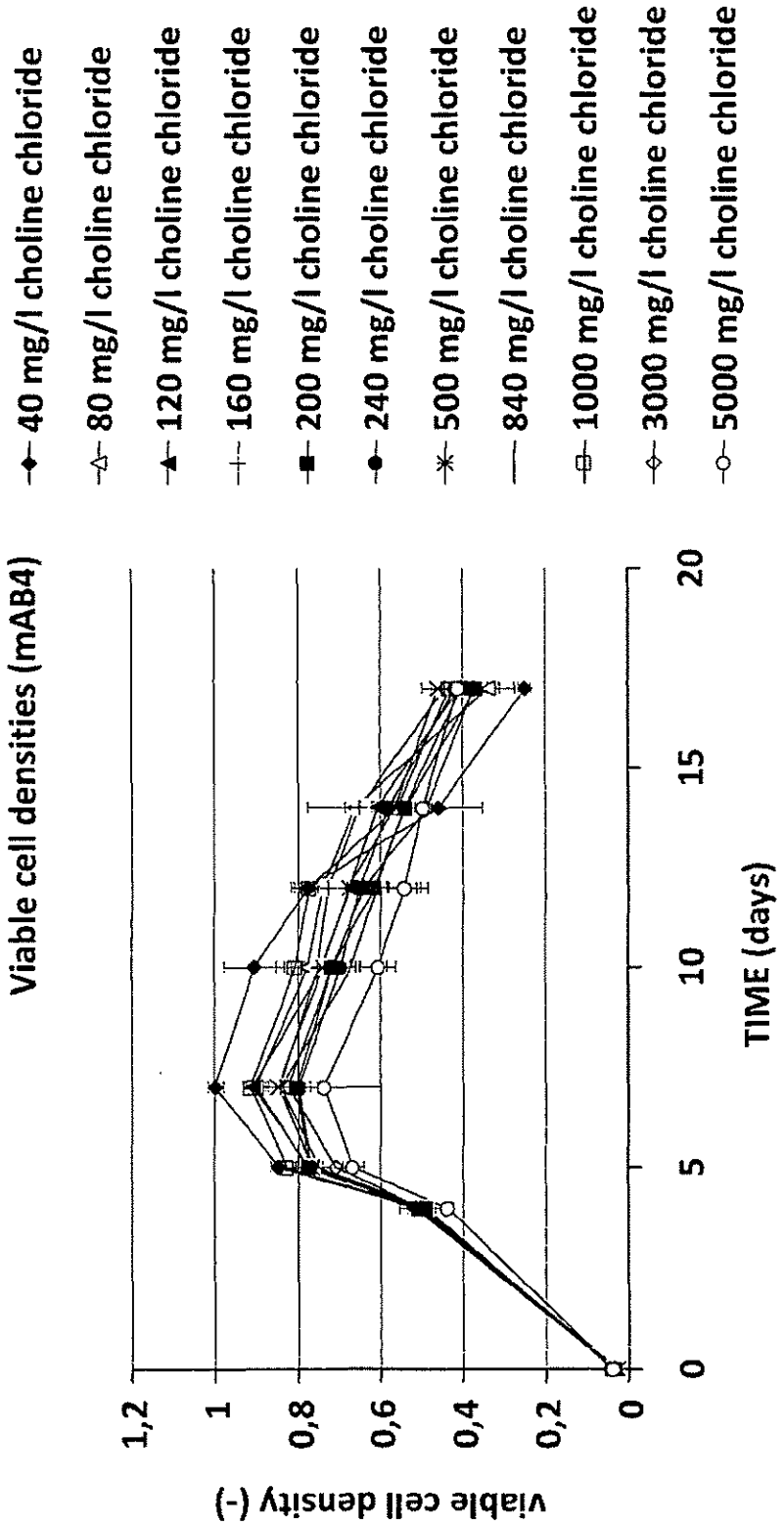

40 mg/l choline chloride
80 mg/l choline chloride
120 mg/l choline chloride
160 mg/l choline chloride
200 mg/l choline chloride
240 mg/l choline chloride
500 mg/l choline chloride
840 mg/l choline chloride
1000 mg/l choline chloride
3000 mg/l choline chloride
5000 mg/l choline chloride
Viable cell densities (mAB4)
viable cell density (-)
1,2
1
0,8
0,6
0,4
0,2
0
0
5
10
15
20
TIME (days)

Fig. 20

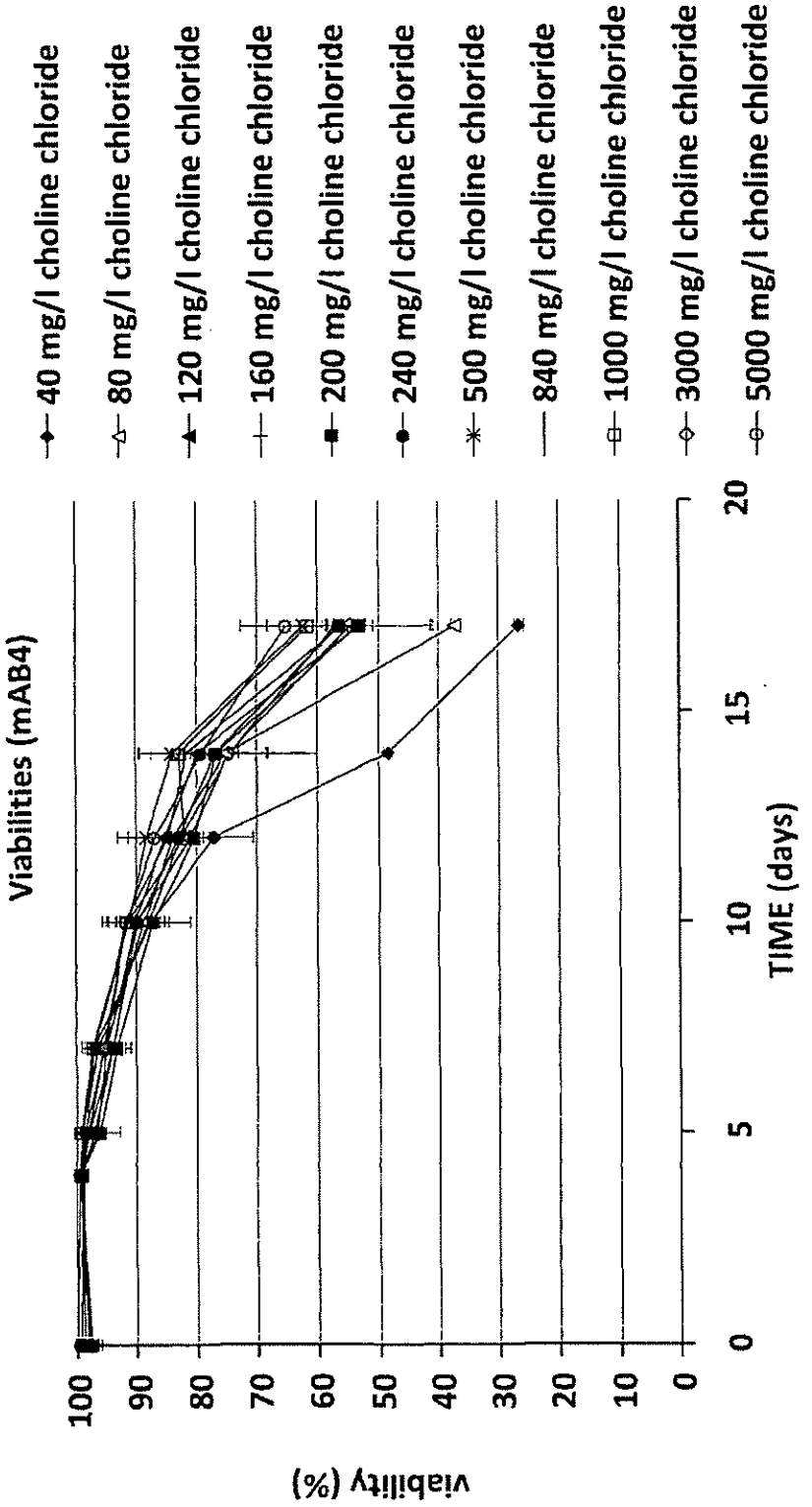

40 mg/l choline chloride
80 mg/l choline chloride
120 mg/l choline chloride
160 mg/l choline chloride
200 mg/l choline chloride
240 mg/l choline chloride
500 mg/l choline chloride
840 mg/l choline chloride
1000 mg/l choline chloride
3000 mg/l choline chloride
5000 mg/l choline chloride
Viabilities (mAB4)
viability (%)
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
TIME (days)

Fig. 21

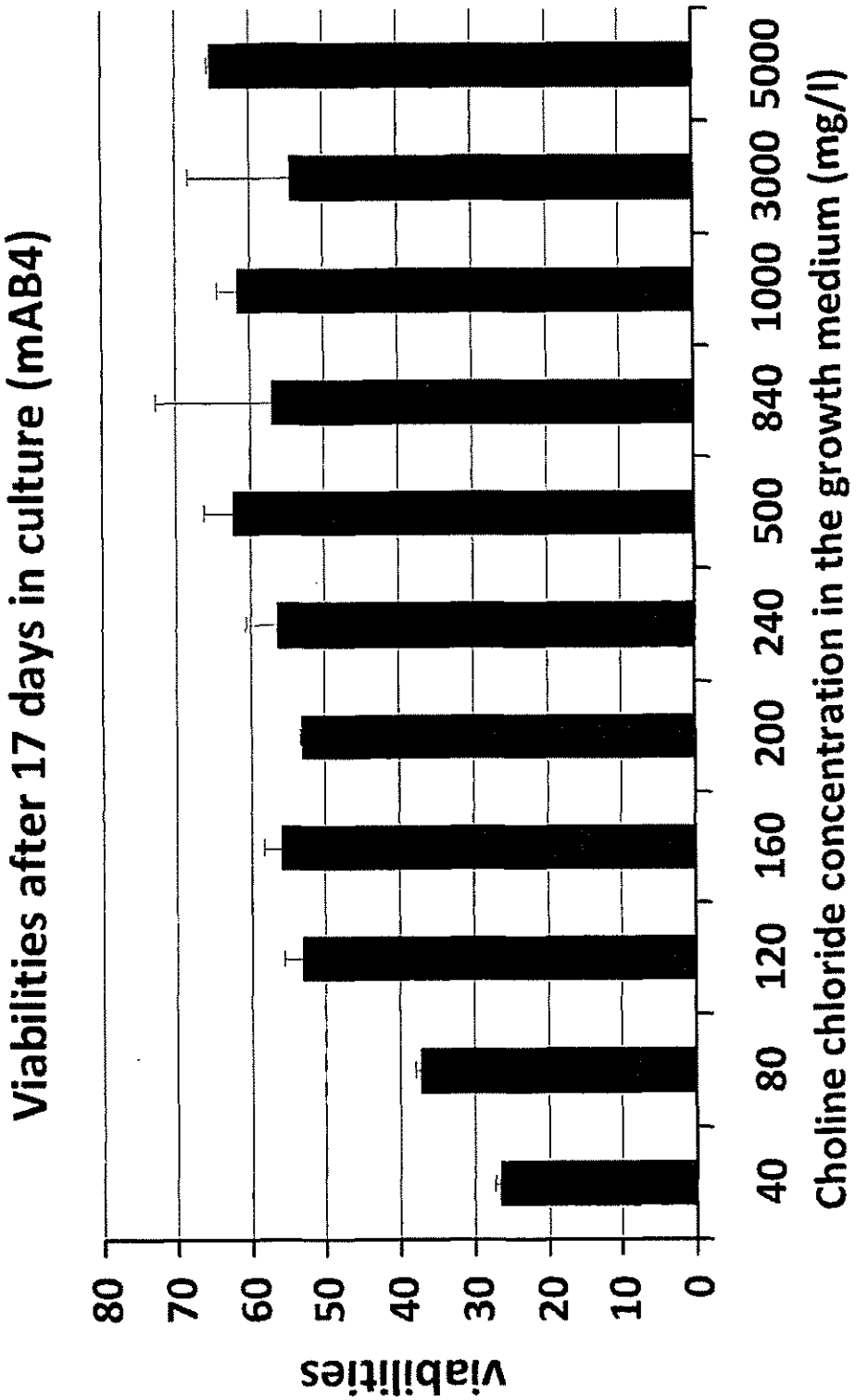

Viabilities after 17 days in culture (mAB4)
viabilities
0
10
20
30
40
50
60
70
80
40
80
120
160
200
240
500
840
1000
3000
5000
Choline chloride concentration in the growth medium (mg/l)

Fig. 22

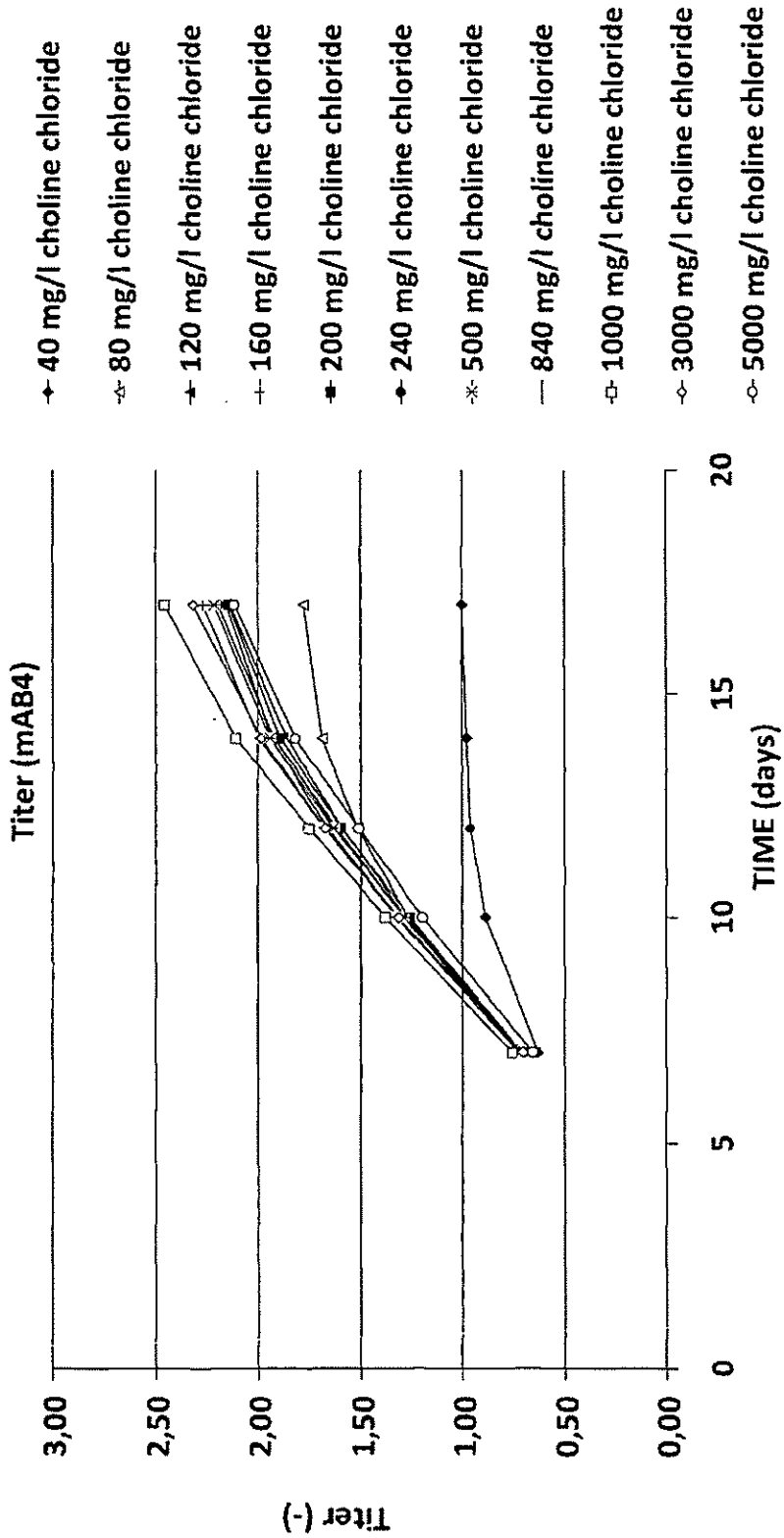

40 mg/l choline chloride
80 mg/l choline chloride
120 mg/l choline chloride
160 mg/l choline chloride
200 mg/l choline chloride
240 mg/l choline chloride
500 mg/l choline chloride
840 mg/l choline chloride
1000 mg/l choline chloride
3000 mg/l choline chloride
5000 mg/l choline chloride
Titer (mAB4)
TIME (days)
Titer (-)
0
5
10
15
20
0,00
0,50
1,00
1,50
2,00
2,50
3,00

Fig. 23

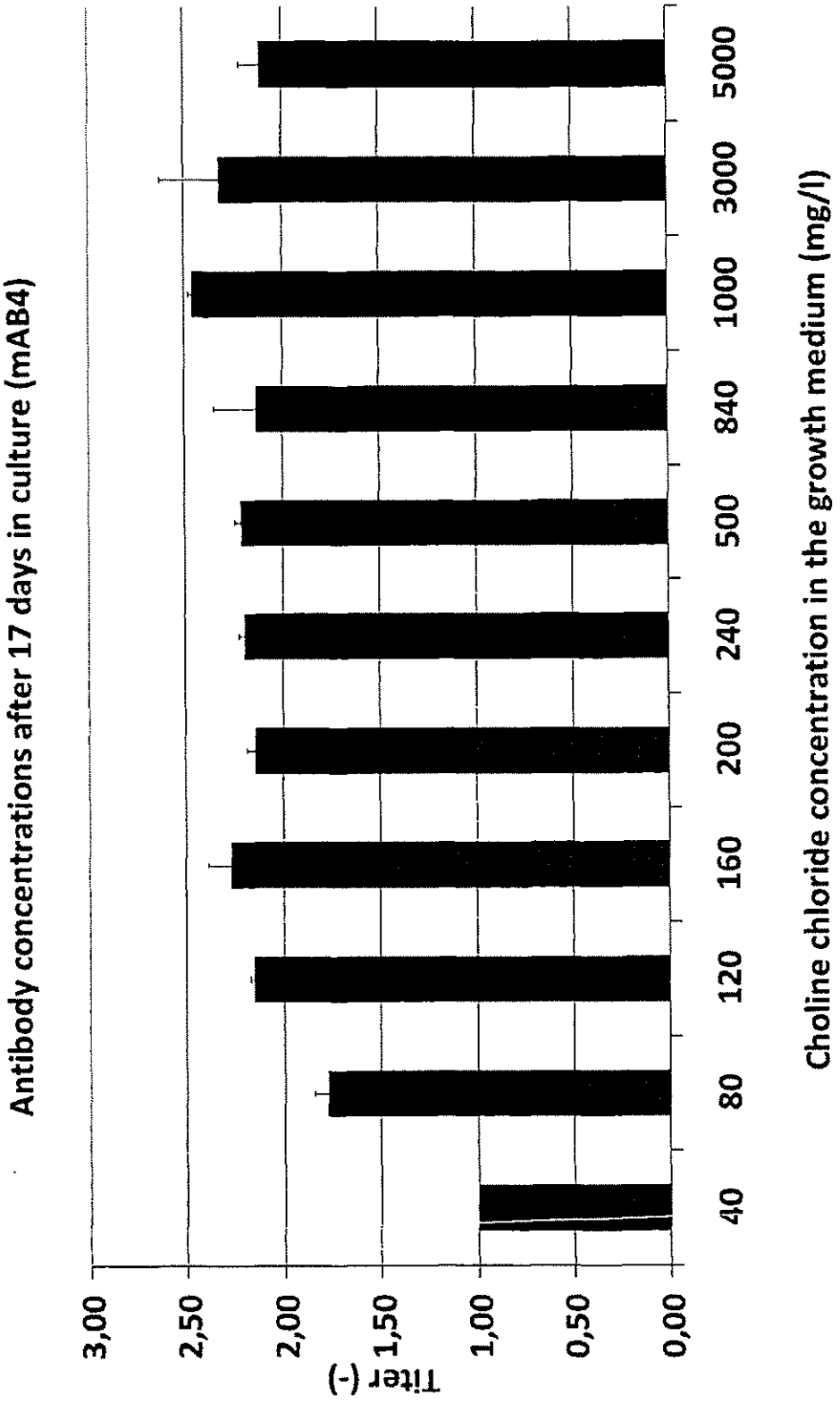
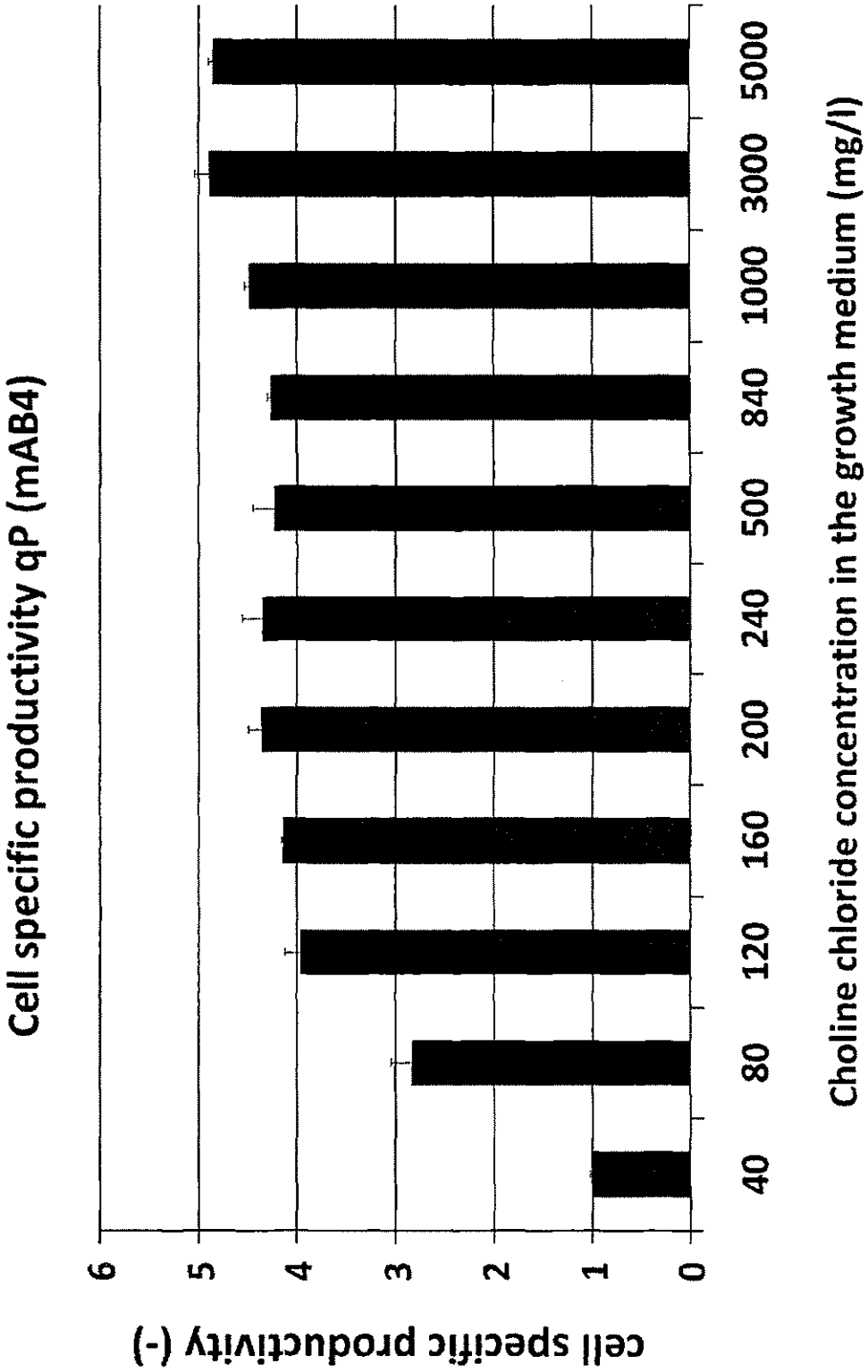

Antibody concentrations after 17 days in culture (mAB4)
Titer (-)
3,00
2,50
2,00
1,50
1,00
0,50
0,00
Choline chloride concentration in the growth medium (mg/l)
40
80
120
160
200
240
500
840
1000
3000
5000

Fig. 24


Cell specific productivity qP (mAB4)
cell specific productivity (-)
0
1
2
3
4
5
6
Choline chloride concentration in the growth medium (mg/l)
40
80
120
160
200
240
500
840
1000
3000
5000