

PHARMACOKINETIC AND BIOANALYTICAL  
PROFILES OF 250  
COMMON DRUGS  
QUICK REFERENCE



## Profiles of 250 Common Drugs Quick Reference

This quick reference was produced to save time. It shall give all those working with the containing or related substances a quick impression of the pharmacokinetics and of bioanalytical behavior of a drug in plasma: scientists in the fields of bioanalysis, pharmacology and / or biology as well as MDs. The pharmacokinetic data including  $C_{max}$ , protein binding,  $t_{1/2}$ , and the chemical / physical data including pKa and MS data, are intended to give instant orientation related to a specific drug.

More details for 100 of these substances (marked by [\*]) can be found in the main source literature "HPLC Methods for Clinical Pharmaceutical Analysis" (see below).

### Sources

- 1) Hermann Mascher, pharm-analyt Lab. GmbH
- 2) Source of substances marked by [\*]:  
Book: HPLC Methods for Clinical Pharmaceutical Analysis (2012)  
Author: Hermann Mascher, pharm-analyt Lab. GmbH  
Publisher: Wiley-VCH  
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Leaflet published 2013 by  
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### Pharmacokinetic and Bioanalytical Properties

| Substance        | $C_{max}$ -value                                   | Protein Binding (PB) | Elimination Half Life $t_{1/2}$  | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s) |
|------------------|----------------------------------------------------|----------------------|----------------------------------|-----------|---------------|------------|-----------------|
| Acebutolol       | 400 mg oral → 700 ng/mL                            | 26 %                 | 3.5 h                            | 9.4       | pos           | 337        | 116/319/98      |
| Acetylcarnitine* | native value ca. 1000 ng/mL                        |                      |                                  | -1.8      | pos           | 204        | 85              |
| Acetylcysteine*  | 200 mg oral → 1.5 µg/mL                            | 78 %                 | 6 h                              | 9.5       | neg           | 162        | 84/33           |
| Acyclovir*       | 200 mg oral → 400 ng/mL                            | 9 - 33 %             | 1.5 - 6 h                        | -1.7      | pos           | 226        | 152/135/110     |
| Allopurinol*     | 100 mg oral → 0.5 µg/mL<br>(usual 1 - 5 µg/mL)     | <5 %                 | 0.5 - 2 h Oxipurnol<br>18 - 43 h | 9.4       | neg           | 135        | 64/92           |
| Alprazolam       | 1 mg oral → 15 ng/mL<br>(ther: 2 - 25 ng/mL)       | 70 - 80 %            | 11 - 15 h                        | 2.4       | pos           | 309        | 205/281/177     |
| Amantadine       | 150 mg oral → 400 ng/mL<br>(ther: 300 - 600 ng/mL) | 67 %                 | 11 - 15 h                        | 10.1      | pos           | 152        | 135/77          |
| Ambroxol*        | 30 mg oral → 80 ng/mL                              | 80 - 90 %            | 7 - 12 h                         | 3.1       | pos           | 379        | 264/104/116     |
| Amikacin         | 500 mg im → 20 µg/mL<br>(ther: 15 - 25 µg/mL)      | <10 %                | 2 - 3 h                          | 2.2/3.7   | pos           | 586        | 163             |
| Amloride*        | 5 mg oral → 15 ng/mL                               | 40 %                 | 10 - 20 h                        | 8.7       | pos           | 230        | 171/116/143     |
| Amiodarone       | 400 mg oral → 0.8 µg/mL<br>(ther: 0.7 - 2.5 µg/mL) | 96 %                 | 20 - 100 days                    | 6.6       | pos           | 646        | 100/86/58       |
| Amisulpride      | (ther: 0.1 - 0.32 µg/mL)                           | 16 %                 | 12 h                             | 9.4       | pos           | 370        | 242             |
| Amitriptyline    | 50 mg oral → 25 ng/mL<br>(ther: 100 - 200 ng/mL)   | 91 - 97 %            | 9 - 25 h                         | 9.4       | pos           | 278        | 233/202/105     |
| Amitriptyline    | (ther: 5 - 15 ng/mL)                               | 97 %                 | 35 - 50 h                        | 8.6       | pos           | 409        | 238/294         |
| Amobarbital      | (ther: 1 - 5 µg/mL)                                | 60 %                 | 20 - 25 h                        | 8.0       | neg           | 225        | 182/42          |

Pharmacokinetic and Bioanalytical Properties

| Substance                 | C <sub>max</sub> -value                                           | Protein Binding (PB)      | Elimination Half Life t <sub>1/2</sub> | pKa-value   | Ionization MS | Parent Ion | Fragment Ion(s) |
|---------------------------|-------------------------------------------------------------------|---------------------------|----------------------------------------|-------------|---------------|------------|-----------------|
| Amoxicillin*              | 500 mg oral → 8 µg/ml                                             | 20 %                      | 1 h                                    | 2.4/7.4/9.6 | pos           | 366        | 349/208/134/114 |
| Amphetamine*              | 10 mg oral → 20 ng/ml<br>after 5 mg Selegelin oral<br>→ 1.5 ng/ml | 15 - 40 %                 | 4 - 8 h                                | 9.9         | pos           | 136        | 91/65/119       |
| Amphotericin B            | (ther: 0.03 - 1 µg/mL)                                            | 90 - 97 %                 | 24 h (long appl.<br>15 days)           | 5.5/10.0    | neg           | 922        | 183             |
| Ampicillin*               | 500 mg oral → 3 µg/ml                                             | 20 %                      | 1 - 2 h                                | 2.5/7.3     | pos           | 350        | 106/192         |
| Anagrelide                | 1 mg/oral → 5 ng/mL                                               | 91 %                      | 1.3 h + 3 days<br>(term)               |             | pos           | 256        | 199/228         |
| Aspirin                   | 900 mg oral → 37 µg/mL                                            | 80 - 90 %<br>(salicylate) | 17 min/2-3h<br>(salicylate)            | 3.5         | neg           | 179        | 93/137          |
| Astemizole                | 10 mg oral → 0.5 ng/mL                                            | 97 %                      | 1 - 3 days                             | 8.8         | pos           | 459        | 135/218         |
| Atenolol                  | 100 mg oral → 600 ng/mL<br>(ther: 200 - 600 ng/mL)                | <5 %                      | 4 - 14 h                               | 9.6         | pos           | 267        | 145/225/148     |
| Atorvastatin              | 40 mg oral → 30 ng/mL                                             | 98 %                      | 14 h                                   | 4.3         | pos           | 559        | 440/250/276     |
| Badtracin*                |                                                                   | 40 - 90 %                 |                                        |             | pos<br>(2++)  | 712        | 119             |
| Baclofen                  | 40 mg oral → 0.6 µg/mL<br>(ther: 0.08 - 0.4 µg/mL)                | 30 %                      | 3 - 4 h                                | 3.9/9.6     | pos           | 214        | 151/178         |
| Bendro-<br>flumethiazide* | 2.5 mg oral → 20 ng/mL                                            | high                      | 3 - 4 h                                | 1.8         | pos           | 422        | 122/405         |
|                           |                                                                   |                           |                                        |             | neg           | 420        | 328/289/224     |

Pharmacokinetic and Bioanalytical Properties

| Substance      | C <sub>max</sub> -value                                | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion          | Fragment Ion(s) |
|----------------|--------------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|---------------------|-----------------|
| Benzbromarone* | 100 mg oral → 3 µg/ml                                  | high                 | 3 h                                    | 6.0       | pos           | 423/<br>425/<br>427 |                 |
| Benzoic Acid*  |                                                        |                      |                                        | 4.2       | pos           | 123                 | 61/81/40        |
| Bezafibrate*   | 200 mg oral → 7 µg/ml                                  | 95 %                 | 2 h                                    | 4.3       | pos           | 362                 | 316/121/139     |
|                |                                                        |                      |                                        |           | neg           | 360                 | 274/154         |
| Bisoprolol     | (ther: 10 - 100 ng/mL)                                 | 30 %                 | 11 h                                   | 9.6       | pos           | 326                 | 116/74          |
| Bromazepam     | 12 mg oral → 130 ng/mL<br>(ther: 80 - 150 ng/mL)       | 40 - 70 %            | 8 - 19 h                               | 2.9/11.0  | pos           | 316                 | 182/209         |
| Budesonide*    | 250 µg spray → 280 pg/ml                               | 88 %                 | 2.8 h                                  |           | pos           | 431                 | 413/147/173     |
|                |                                                        |                      |                                        |           | neg           | 489                 | 357             |
| Buprenorphine  | 0.4 mg sublingual → 0.7 ng/mL<br>(ther: 0.5 - 5 ng/mL) | 96 %                 | 1 - 7 h                                | 8.5/10.0  | pos           | 468                 | 396/414         |
| Buspirone      | 20 mg oral → 3 ng/mL<br>(ther: max 1 - 6 ng/mL)        | 95 %                 | 2 - 11 h                               | 7.6       | pos           | 386                 | 122             |
| Busulfan       | 6 mg oral → 80 ng/mL                                   | 32 %                 | 2 - 3 h                                |           | pos           | 264                 | 151/247         |
| Butorphanol*   | 15 mg oral → 2 ng/ml                                   | 80 %                 | 2 - 4 h                                | 3.7       | pos           | 328                 | 310             |
| Caffeine*      | 100 mg oral → 3 µg/ml<br>(usual 2 - 10 µg/ml)          | 35 %                 | 2 - 10 h                               | 14.0      | pos           | 195                 | 138/110/83      |
| Candesartan    | 8 mg oral → 100 ng/mL<br>(ther: 80 - 180 ng/mL)        | 99 %                 | 9 h                                    | 3.0       | pos           | 441                 | 263/423         |

Pharmacokinetic and Bioanalytical Properties

| Substance               | C <sub>max</sub> -value                                                      | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value   | Ionization MS | Parent Ion | Fragment Ion(s) |
|-------------------------|------------------------------------------------------------------------------|----------------------|----------------------------------------|-------------|---------------|------------|-----------------|
| Canrenone*              | after 100 mg oral Spironolacton → 350 ng/ml Canrenone (usual 50 - 250 ng/ml) | >90 %                | 15 - 21 h                              |             | pos           | 341        | 205/323         |
| Captopril*              | 100 mg oral → 0.8 µg/ml                                                      | 30 %                 | 1 - 2 h                                | 3.7/9.8     | pos           | 218        | 116/70/75       |
| Carbamazepine*          | 200 mg oral → 4 µg/ml (usual 3 - 12 µg/ml)                                   | 75 %                 | 10 - 30 h                              |             | neg           | 216        | 182/114         |
| Carvedilol*             | 20 mg oral → 50 ng/ml                                                        | 98 %                 | 4 - 8 h                                | 3.0         | pos           | 237        | 194/192/179     |
| Cefalexin               | 500 mg oral → 18 µg/mL                                                       | 15 %                 | 1 h                                    | 2.5/5.2/7.3 | pos           | 407        | 222/100/194     |
| Cefazolin               | 500 mg im → 30 µg/mL (ther. 10 - 150 µg/mL)                                  | 85 %                 | 1.8 h                                  | 3.0         | pos           | 348        | 158/174/140     |
| Cefotaxime              | 500 mg im → 12 µg/mL (ther. 0.5 - 40 µg/mL)                                  | 40 %                 | 1 h                                    | 3.2/4.2     | pos           | 455        | 323             |
| Ceftriaxone             | 500 mg im → 40 µg/mL                                                         | 85 - 95 %            | 6 - 9 h                                | 3.0/3.2/4.1 | pos           | 456        | 324/156/277     |
| Cefuroxime              | 750 mg im → 27 µg/mL (ther. 10 - 150 µg/mL)                                  | 50 %                 | 70 min                                 | 2.5         | pos           | 555        |                 |
| Cetirizine              | 10 mg oral → 275 ng/mL                                                       | 93 %                 | 10 h                                   | 3.6/7.8     | neg           | 423        | 207/318/362     |
| Chlordiazepoxide        | 20 mg oral → 1.0 µg/mL (ther. 0.7 - 2 µg/mL)                                 | 96 %                 | 5 - 30 h                               | 4.8         | pos           | 389        | 201/166         |
| Chlorpromazine          | 150 mg oral → 18 ng/mL (ther. 30 - 150 ng/mL)                                | 95 - 98 %            | 30 h                                   | 9.3         | pos           | 300        | 227/282         |
| Chlorthalidone (Blood)* | 25 mg oral → 1.5 µg/ml whole blood (ca. 98 % erythrocytes)                   | 75 % plasma          | 35 - 70 h                              | 9.4         | pos           | 319        | 246/86          |
|                         |                                                                              |                      |                                        |             | pos           | 339        | 322/243         |

Pharmacokinetic and Bioanalytical Properties

| Substance                     | C <sub>max</sub> -value                           | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion          | Fragment Ion(s) |
|-------------------------------|---------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|---------------------|-----------------|
| Ciclesonide*                  | after inhalation >100 pg/ml                       | >99 %                | 0.7 h (3.5 h Des-C(C)                  |           | neg           | 599 (acetic adduct) | 339             |
| Cimetidine*                   | 400 mg oral → 2 µg/ml (usual 0.5 - 1 µg/ml)       | 13 - 26 %            | 1 - 3 h                                | 6.8       | pos           | 253                 | 159/95/117      |
| Cinnarizine*                  | 25 mg oral → 100 ng/ml                            |                      | 5 h                                    | 5.4       | neg           | 251                 | 97/123          |
| Ciprofloxacin                 | 500 mg oral → 2.5 µg/mL (ther. 1 - 5 µg/mL)       | 20 - 40 %            | 3.5 - 4.5 h                            | 6.1       | pos           | 369                 | 167/152         |
| Citalopram                    | 30 mg oral → 30 ng/mL (ther. 50 - 110 ng/mL)      | 50 %                 | 33 h                                   | 9.2       | pos           | 332                 | 288/245/109     |
| Clarithromycin*               | 250 mg oral → 900 ng/ml                           | 42 - 50 %            | 3 - 4 h                                | 3.2       | pos           | 325                 | 109/262/234     |
| Clenbuterol                   | (ther. 0.3 - 0.6 ng/mL)                           |                      | 36 - 48 h                              | 9.6       | pos           | 748                 | 590/158         |
| Clindamycin                   | 150 mg oral → 2 µg/mL                             | 90 %                 | 2 - 3 h                                | 7.6       | pos           | 278                 | 204/260         |
| Clofibrate (→ Clofibric acid) | 1 g oral → 55 µg/mL                               | 95 %                 | 18 - 22 h                              | 3.0       | pos           | 425                 | 126             |
| Clomipramine                  | 50 mg oral → 50 ng/mL (ther. 50 - 150 ng/mL)      | 90 - 95 %            | 36 h                                   | 9.2       | neg           | 213                 | 127/85          |
| Clonazepam                    | 2 mg oral → 17 ng/mL (ther. 10 - 70 ng/mL)        | 86 %                 | 20 - 40 h                              | 1.5/10.5  | pos           | 315                 | 86/58/227       |
| Clonidine                     | 0.3 mg oral → 1.4 ng/mL                           | 20 - 40 %            | 6 - 24 h                               | 8.2       | pos           | 316                 | 270/214/241     |
| Codeine*                      | 50 mg oral → 0.2 µg/ml (usual 0.025 - 0.15 µg/ml) | 7 - 25 %             | 2 - 4 h                                | 8.2       | pos           | 230                 | 133/213/44      |
| Cytarabine                    |                                                   | 13 %                 | 1 - 3 h                                | 4.3       | pos           | 300                 | 165/153         |
|                               |                                                   |                      |                                        |           | pos           | 244                 | 112/134/95      |

Pharmacokinetic and Bioanalytical Properties

| Substance        | C <sub>max</sub> -value                           | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value   | Ionization MS | Parent Ion    | Fragment Ion(s) |
|------------------|---------------------------------------------------|----------------------|----------------------------------------|-------------|---------------|---------------|-----------------|
| Dexamethasone    |                                                   | 77 %                 | 3 h / 40 h                             |             | pos           | 393           | 355/337/237     |
| Dextrothorphan*  | after 60 mg Dextrometorphan → 700 ng/ml           |                      | 3 h                                    | 3.4         | pos           | 258           | 199             |
| Diazepam*        | 5 mg oral → 100 ng/ml<br>(usual 200 - 500 ng/ml)  | 98 - 99 %            | 20 - 100 h                             | 3.3         | pos           | 285           | 193/154/222     |
| Diclofenac*      | 50 mg oral → 800 ng/ml<br>(usual 50 - 2500 ng/ml) | >99 %                | 1 - 2 h                                | 3.1         | pos           | 296           | 214/250/178     |
| Dihydralazine*   | 25 mg oral → 50 ng/ml                             |                      | 1 - 2 h                                | 0.2         | pos           | 191           | 129/102/174     |
| Diltiazem        | (ther. 50 - 200 ng/mL)                            | 80 %                 | 4 h                                    | 9.3         | pos           | 415           | 178/150         |
| Diphenhydramine* | 50 mg oral → 50 ng/ml<br>(usual 80 - 400 ng/ml)   | 78 %                 | 2 - 9 h                                | 3.1         | pos           | 256           | 165/152/167     |
| Dipyridamole*    | 100 mg oral → 2 µg/ml                             | >90 %                | 12 h                                   | 6.4         | pos           | 505           | 429/385         |
| Docetaxel        | 200 mg iv → 4 µg/mL                               | 95 %                 | 11 h / 86 h                            |             | pos           | 808           | 226/527         |
| Donepezil        | (ther. ca. 30 ng/mL)                              | 95 %                 | 70 h                                   | 8.6         | pos           | 380           | 91              |
| Doxazosin        |                                                   | 98 %                 | 22 h                                   | 7.2         | pos           | 452           | 344/247         |
| Doxorubicin*     | 1.5 mg/kg iv                                      | 76 %                 | 3 and 40 h                             | 8.2/10.2    | pos           | 544           | 361/321/397     |
|                  |                                                   |                      |                                        |             | neg           | 542           | 395             |
| Doxycycline*     | 100 mg oral → 3 µg/ml<br>(usual 3 - 5.3 µg/ml)    | 82 - 90 %            | 22 h                                   | 3.5/7.7/9.5 | pos           | 446 (decomp.) | 156/428         |
| Duramycin*       | >1 - 10 ng/ml                                     |                      |                                        |             | pos [2++]     | 1007          | 1007            |

Pharmacokinetic and Bioanalytical Properties

| Substance               | C <sub>max</sub> -value                        | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s) |
|-------------------------|------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|------------|-----------------|
| Enalapril               | (ther. 10 - 50 ng/mL)                          | 50 - 60 %            | 11 h                                   | 3.0/5.4   | pos           | 377        | 234/303         |
| Ephedrine               | 22 mg oral → 80 ng/mL                          |                      | 3 - 6 h                                | 9.6       | pos           | 166        | 148/115/91      |
| Epirubicin              |                                                | 77 %                 | 30 - 40 h                              | 9.5/8.9   | pos           | 544        | 397/130         |
| Erythromycin*           | 500 mg oral → 2 µg/ml                          | 70 - 80 %            | 1 - 3 h                                | 8.9       | pos           | 734        | 576/158/83      |
| Esmolol                 |                                                | 55 %                 | 9 min                                  | 9.4       | pos           | 296        | 145/219         |
| Ethosuximide            | (ther. 40 - 100 µg/mL)                         | low                  | 40 - 60 h                              | 9.5       | pos           | 142        | 114/65          |
| Famotidine              |                                                | 15 - 20 %            | 3 h                                    | 8.4       | pos           | 338        | 259/189         |
| Felodipine              |                                                | 99 %                 | 11 - 16 h                              | 5.4       | pos           | 384        | 356/338         |
| Fentanyl                | 0.2 mg iv → 2 ng/mL max.                       | 80 %                 | 2 - 7 h                                |           | pos           | 337        | 188/105         |
| Finasteride             |                                                | 90 %                 | 6 h                                    |           | pos           | 373        | 317/305         |
| Fluconazole             | 400 mg oral → 7 µg/mL                          | 12 %                 | 30 h                                   | 2.6       | pos           | 307        | 238/220         |
| Flufenamic acid         |                                                | strong               | 3 h                                    | 3.9       | neg           | 280        | 236             |
| Fluoxetine              | (ther. [+ Norf.] 0.12 - 0.50 µg/mL)            | 95 %                 | 2 - 6 days                             | 9.5       | pos           | 310        | 148             |
| Fluphenazine            | 5 mg oral → 0.6 ng/mL<br>(ther. 0.2 - 4 ng/mL) | 99 %                 | 15 - 30 h                              | 3.9/8.1   | pos           | 438        | 171/143         |
| Flurbiprofen            | 100 mg oral → 12 µg/mL                         | 99 %                 | 3 - 6 h                                | 4.7       |               |            |                 |
| Fluticasone Propionate* | >50 - 100 pg/ml<br>after inhalation            | 81 - 95 %            | 3.5 h                                  |           | pos           | 501        | 313/293/205     |

Pharmacokinetic and Bioanalytical Properties

| Substance              | C <sub>max</sub> -value                                 | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s) |
|------------------------|---------------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|------------|-----------------|
| Formoterol*            | after inhalation of 36 µg → 30 pg/ml                    |                      | 8 h                                    | 1.4       | pos           | 345        | 149             |
| Fosinopril             |                                                         | 95 %                 | 11.5 h                                 | 3.9       | neg           | 562        | 490/416/220     |
| Furosemide*            | 80 mg oral → 2.3 µg/ml (usual 2 - 5 µg/ml)              | 97 %                 | 1 - 3 h                                | 3.9       | pos           | 331        | 119/303/299     |
|                        |                                                         |                      |                                        |           | neg           | 329        | 285/205/78      |
| Gabapentin             | (ther: 2 - 10 µg/mL)                                    | low                  | 5 - 7 h                                | 3.7/10.7  | pos           | 172        | 154/137         |
| Galantamine            | (ther: max 30 - 60 ng/mL)                               | low                  | 7 h                                    |           | pos           | 288        | 231/225/213     |
| Gemfibrozil            |                                                         | 98 %                 | 1.5 h                                  | 4.5       | neg           | 249        | 121             |
| Gentamycin (C1/C1a/C2) | 70 mg im → 4 µg/mL (ther: 4 - 12 µg/mL)                 | <30 %                | 2 - 3 h                                | 10.2      | pos           | 478        | 434/285/160     |
| Glibenclamide*         | 3.5 mg oral → 150 ng/mL (usual maximum 100 - 300 ng/ml) | 99 %                 | 5 - 16 h                               | 5.3       | pos           | 494        | 369/169/304     |
| Glizalide              | 80 mg oral → 2 µg/mL                                    | 85 - 95 %            | 10 - 12 h                              | 5.8       | pos           | 324        | 127/110         |
| Glimepiride            |                                                         | 99 %                 | 9 h                                    | 4.3       | pos           | 491        | 352             |
| Granisetron            |                                                         | 65 %                 | 3 - 4 h                                | 9.0       | pos           | 313        | 138             |
| Haloperidol            | ss <50 ng/mL (ther: 1 - 33 ng/mL)                       | 92 %                 | 12 - 38 h                              | 8.3       | pos           | 376        | 165/123         |
| Hexobarbital           | 500 mg oral → 7 µg/mL (ther: 1 - 5 µg/mL)               | 42 - 52 %            | 3 - 7 h                                | 8.2       | pos           | 237        | 205/213/81      |
| Hydrochlorothiazide*   | 50 mg oral → 300 ng/mL (usual 50 - 160 ng/ml)           | 60 %                 | 2.5 - 10 h                             | 7.0/9.2   | neg           | 296        | 205/269/78      |

Pharmacokinetic and Bioanalytical Properties

| Substance                 | C <sub>max</sub> -value                        | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value    | Ionization MS | Parent Ion | Fragment Ion(s) |
|---------------------------|------------------------------------------------|----------------------|----------------------------------------|--------------|---------------|------------|-----------------|
| Hydrocodone               | 10 mg oral → 23 ng/mL                          | 30 %                 | 4 h                                    | 8.3          | pos           | 300        | 199/171         |
| Hydrocortisone (Cortisol) | (native 20 - 250 ng/mL)                        | 90 %                 | 100 min                                |              | pos           | 363        | 121/309         |
| Ibuprofen*                | 200 mg oral → 20 µg/ml (usual 15 - 30 µg/ml)   | 99 %                 | 2 h                                    | 3.8          | neg           | 206        | 161/91/119      |
| Imipramine                | (ther: Imi + Desimi 45- 150 ng/mL)             | 85 - 95 %            | 9 - 28 h                               | 9.5          | pos           | 281        | 86/58/208       |
| Indomethazin*             | 50 mg oral → 1.5 µg/ml (usual 0.8 - 2.5 µg/ml) | 90 - 99 %            | 3 - 15 h                               | 4.5          | pos           | 358        | 139             |
| Irbesartan                |                                                | 96 %                 | 11 - 15 h                              | 4.1          | pos           | 429        | 207/195         |
| Isoniazid                 | 300 mg oral → 5 µg/mL (ther: 0.2 - 10 µg/mL)   | very low             | 1 - 6 h                                | 1.8/3.5/10.8 | pos           | 138        | 121             |
| Isosorbid-5-mononitrate*  | 20 mg oral → 600 ng/ml                         | >5 %                 | 3 - 7 h                                |              | pos           | 192        |                 |
| Itraconazol*              | 200 mg daily → 2 µg/ml (usual 0.2 - 2 µg/ml)   | 99.8 %               | 20 h                                   | 6.2          | pos           | 705        | 392/432/450     |
| Ketoconazole*             | 400 mg oral → 6.5 µg/ml                        | 99 %                 | 6 - 10 h                               | 4.5          | pos           | 531        | 489/148/219     |
| Ketoprofen                | 100 mg oral → 10 µg/mL                         | 99 %                 | 1.5 - 4 h                              | 4.7          | pos           | 255        | 209/105         |
| Ketotifen                 | 2 mg oral → 0.6 ng/mL                          | 75 %                 | 21 h                                   | 8.4          | pos           | 310        | 96              |
| Lamotrigine               | (ther: 3 - 14 µg/mL)                           | 55 %                 | 24 h                                   | 5.7          | pos           | 257        | 160/166         |
| Lansoprazole*             | 30 mg oral → 900 ng/ml                         | 97 %                 | 1 - 2 h                                | 2.8          | neg           | 368        | 164             |

Pharmacokinetic and Bioanalytical Properties

| Substance       | C <sub>max</sub> -value                              | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value            | Ionization MS | Parent Ion | Fragment Ion(s)  |
|-----------------|------------------------------------------------------|----------------------|----------------------------------------|----------------------|---------------|------------|------------------|
| Levodopa*       | 250 mg oral → 1400 ng/ml<br>(usual 200 - 2500 ng/ml) | <5 %                 | 1 - 3 h                                | 2.3/8.7/<br>9.7/13.4 | pos           | 198        | 152/139/181      |
| Lidocaine       | nach iv<br>(ther: 1.5 - 5 µg/mL)                     | 66 %                 | 1 - 2 h                                | 9.5                  | pos           | 235        | 135/109          |
| Lisinopril      | (ther: 20 - 70 ng/mL)                                | low                  | 12 h                                   | 2.5/4.0/<br>6.7/10.1 |               |            | 84/246           |
| Loperamide      | 8 mg oral → 2 ng/mL<br>(ther: max 1 - 3 ng/mL)       | 97 %                 | 10 h                                   | 8.7                  | pos           | 477        | 266/210          |
| Loratadine      |                                                      | 98 %                 | 8 h                                    | 4.3                  | pos           | 383        | 337              |
| Lornoxicam*     | 4 mg oral → 2 µg/ml                                  | 99 %                 | 3 - 4 h                                | 3.0                  | pos           | 372        | 121              |
|                 |                                                      |                      |                                        |                      | neg           | 370        | 306/186/171/ 150 |
| Losartan        | (ther: 5 - 63 ng/mL)                                 | 98 %                 | 1.5 - 2.5 h                            | 5.5                  | pos           | 423        | 405/207          |
| Maprotiline     | 75 mg → 23 ng/mL<br>(ther: 75 - 300 ng/mL)           | 90 %                 | 20 - 70 h                              | 9.5                  | pos           | 278        | 191/250/178      |
| Mebendazole     | 700 mg oral → 70 ng/mL<br>(ther: 10 - 100 ng/mL)     | 95 %                 | 1.5 - 9 h                              |                      | pos           | 296        | 264/105/77       |
| Medazepam       | 10 mg oral → 210 ng/mL                               | 98 %                 | 1 - 2 h                                | 6.2                  | pos           | 271        | 207/91/165       |
| Mefenamic Acid* | 1000 mg → 10 µg/ml                                   | 99 %                 | 3 - 4 h                                | 4.2                  | pos           | 242        | 224/209/180      |
|                 |                                                      |                      |                                        |                      | neg           | 240        | 196/180          |
| Meloxicam       |                                                      | 99 %                 | 20 h                                   | 4.5                  | pos           | 352        | 115              |
| Mesatamine      |                                                      | 40 - 50 %            | 1 h                                    | 2.0/5.9              | pos           | 154        | 108              |

Pharmacokinetic and Bioanalytical Properties

| Substance                                 | C <sub>max</sub> -value                            | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value           | Ionization MS | Parent Ion | Fragment Ion(s) |
|-------------------------------------------|----------------------------------------------------|----------------------|----------------------------------------|---------------------|---------------|------------|-----------------|
| Metformin*                                | 500 mg oral → 1.6 µg/ml<br>(usual 0.1 - 1.3 µg/ml) | <5 %                 | 3 - 6 h                                | 2.8/11.5            | pos           | 130        | 60/71/85        |
| Methadone                                 | 15 mg oral → 70 ng/mL<br>(ther: 0.05 - 1 µg/mL)    | 60 - 90 %            | 10 - 50 h                              | 8.3                 | pos           | 310        | 265/105         |
| Methaqualone                              | 250 mg oral → 2 µg/mL<br>(ther: 1 - 3 µg/mL)       | 75 - 95 %            | 20 - 60 h                              |                     | pos           | 251        | 132/91/117      |
| Methotrexate                              | 30 mg oral → 410 ng/mL                             | 50 - 95 %            | 3 - 10 h                               | 3.8/4.8/5.6         | pos           | 455        | 308             |
| 5-Methoxypsoralen +<br>8-Methoxypsoralen* | 40 mg oral → 50 ng/ml<br>30 mg oral → 300 ng/ml    | >90 %                | 2.3 h<br>3 h                           |                     | pos           | 217        | 174             |
| Methylprednisolone                        |                                                    | 78 %                 | 4 h                                    |                     | pos           | 375        | 357/339/185     |
| Metoprolol*                               | 100 mg oral → 150 ng/ml<br>(usual 100 - 600 ng/ml) | 12 %                 | 2 - 7 h                                | 9.7                 | pos           | 268        | 77/116/103      |
| Metronidazole*                            | 250 mg oral → 9 µg/ml<br>(usual 10 - 30 µg/ml)     | 11 %                 | 8 h                                    | 2.5                 | pos           | 172        | 128/82          |
| Mianserin                                 | 60 mg oral → 100 ng/mL<br>(ther: 15 - 70 ng/mL)    | 90 %                 | 6 - 40 h                               | 6.9                 | pos           | 265        | 208/193         |
| Miconazole                                | 1000 mg oral → 1 µg/mL                             | 90 %                 | 24 h                                   | 6.7                 | pos           | 417        | 159/161         |
| Midazolam*                                | 20 mg oral → 260 ng/ml<br>(usual 80 - 250 ng/ml)   | 95 %                 | 2 h                                    | 4.3                 | pos           | 326        | 291/244/249     |
| Midodrine<br>(prodrug)                    |                                                    | low                  | 25 min<br>(active<br>Metab. 3 h)       | 7.8                 | pos           | 255        | 180/237         |
| Minocycline*                              | 50 mg oral → 1.5 µg/ml                             | 75 %                 | 11 - 26 h                              | 2.8/5.0/<br>7.8/9.5 | pos           | 458        | 441/352/283     |

Pharmacokinetic and Bioanalytical Properties

| Substance       | C <sub>max</sub> -value                         | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s) |
|-----------------|-------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|------------|-----------------|
| Mirtazapine     |                                                 | 85 %                 | 20 - 40 h                              | 6.7       | pos           | 266        | 195/72          |
| Montelukast*    | 10 mg oral → 400 ng/ml                          | >99 %                | 2.7 - 5.5 h                            | 9.5       | pos           | 586        | 568             |
| Morphine        | 10 mg im → 56 ng/mL                             | 20 - 35 %            | 2 h                                    | 6.1/9.9   | pos           | 286        | 152/165/185     |
| Moxifloxacin    |                                                 | 50 %                 | 12 h                                   | 5.7/9.4   | pos           | 402        | 261             |
| Moxonidine      | (ther. 1 - 3 ng/mL)                             | 7 %                  | 2 - 3 h                                |           | pos           | 242        | 44/199/206      |
| Nablon®         | 2 mg oral → 2 ng/ml                             |                      | 2 h                                    | 7.1       | pos           | 373        | 247             |
| Naloxone        | 0.4 mg iv → 10 ng/mL                            | 40 %                 | 1-2 h                                  | 7.9       | pos           | 328        | 310/212         |
| Naproxen        | 250 mg oral → 38 µg/mL<br>(ther. 25 - 75 µg/mL) | 99 %                 | 13 h                                   | 4.2       | pos           | 231        | 185/170/153     |
| Nebivolol       | (ther. max. 1 - 8 ng/mL)                        | 98 %                 | 10 - 24 h                              | 9.5       |               |            |                 |
| Neomycin*       |                                                 |                      | 4 h                                    |           | pos [2+]      | 308        | 454             |
| Nicergoline     |                                                 | >90 %                | 13 - 20 h                              | 8.1       |               |            |                 |
| Nicorandil*     | 20 mg oral → 250 ng/ml                          | few                  | 1 h                                    | 0.4       | pos           | 212        | 136             |
| Nifedipine*     | 10 mg oral → 80 ng/ml<br>(usual 10 - 200 ng/ml) | 96 %                 | 2 - 6 h                                | 2.5       | pos           | 347        | 254/195/167     |
| Nitrazepam      | 5 mg oral → 40 ng/mL<br>(ther. 30 - 90 ng/mL)   | 87 %                 | 24 - 30 h                              | 3.2/10.8  | pos           | 282        | 236/180/207     |
| Nitrofurantoin* | 100 mg oral → 1 µg/ml                           | 60 %                 | 0.5 - 1 h                              | 7.2       | neg           | 237        |                 |
| Norfloxacin*    | 400 mg oral → 1.3 µg/ml                         | 14 %                 | 3 - 4 h                                |           | pos           | 320        | 302/233/276     |

Pharmacokinetic and Bioanalytical Properties

| Substance             | C <sub>max</sub> -value                                                                            | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s)   |
|-----------------------|----------------------------------------------------------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|------------|-------------------|
| Ofloxacin             | 400 mg oral → 4 µg/mL<br>(ther. 1 - 4 µg/mL)                                                       | 25 %                 | 4 - 7 h                                | 5.5/6.2   | pos           | 362        | 261/318/344       |
| Olanzapine            | (ther. 10 - 60 ng/mL)                                                                              | 93 %                 | 35 h                                   |           | pos           | 313        | 256/198           |
| Omeprazole*           | 20 mg oral → 480 ng/ml<br>(usual maximum 800 - 4400 ng/ml)                                         | 95 %                 | 0.5 - 3 h                              | 2.2       | pos           | 345        | 297/149/282       |
| Ondansetron           |                                                                                                    | 75 %                 | 3 - 5 h                                | 7.4       | pos           | 294        | 170/184/212       |
| Oxazepam*             | 40 mg oral → 600 ng/ml<br>(usual 0.5 - 2.0 µg/ml)                                                  | 95 %                 | 4 - 25 h                               | 1.7/11.6  | pos           | 287        | 241/269/104       |
| Oxycodone             | 4 mg oral → 24 ng/mL<br>(ther. 5 - 50 ng/mL)                                                       | 45 %                 | 2 - 4 h                                | 8.9       | pos           | 316        | 298/241/212       |
| Paclitaxel*           | 50 - 500 ng/ml                                                                                     | 95 - 98 %            | 3 - 50 h                               | 3.3       | pos           | 854        | 286               |
| p-Aminosalicylic acid | 4 g oral → 50 µg/mL<br>(ther. max 50 µg/mL)                                                        | 50 - 70 %            | 1 h                                    | 1.8/3.6   | neg           | 152        | 108               |
| Pantoprazole*         | 40 mg oral → 1.2 µg/ml<br>(usual maximum 1.1 - 3.1 µg/ml)                                          | 98 %                 | 1 h                                    | 1.7       | pos           | 384        | 200               |
| Paracetamol*          | 10 - 20 µg/ml<br>(usual therapeutic range toxic/<br>poisonous >300 µg/ml)<br>500 mg oral → 5 µg/ml | <5 %                 | 1.5 - 3 h                              | 9.5       | pos           | 152        | 110/65/93         |
| Paroxetine*           | 25 mg oral → 15 ng/ml<br>(usual 10 - 100 ng/ml)                                                    | 95 %                 | 21 h                                   | 4.7       | pos           | 330        | 192/70/135        |
| Penicillin V*         | 700 mg oral → 7 µg/ml                                                                              | 80 %                 | 0.5 h                                  | 2.7       | pos<br>neg    | 351<br>349 | 160/114<br>93/114 |



Pharmacokinetic and Bioanalytical Properties

| Substance              | C <sub>max</sub> -value                               | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s) |
|------------------------|-------------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|------------|-----------------|
| Pentoxiphylline*       | 600 mg oral retard → 100 ng/ml (usual 20 - 200 ng/ml) | <5 %                 | 0.4 - 0.8 h                            | 0.6       | pos           | 279        | 181/99/138      |
| Perphenazine           | (ther: 1 - 20 ng/mL)                                  |                      | 8 - 12 h                               | 7.8       | pos           | 404        | 171/143         |
| Pethidine (Meperidine) | 50 mg oral → 0.14 µg/mL (ther: 0.2 - 0.8 µg/mL)       | 60 - 80 %            | 3 - 6 h                                | 8.7       | pos           | 248        | 220/174         |
| Phenobarbital*         | 150 mg oral → 10 - 30 µg/ml (usual 10 - 40 µg/ml)     | 50 %                 | 50 - 150 h                             | 7.4       | neg           | 231        | 144/188         |
| Phenylbutazone*        | 300 mg oral → 38 µg/ml (usual 50 - 150 µg/ml)         | 99 %                 | 28 - 120 h                             | 4.4       | pos           | 309        | 160/77/92       |
| Phenytoin*             | 100 mg oral → 2.2 µg/ml → (usual 10 - 20 µg/ml)       | 90 %                 | 7 - 60 h                               | 8.3       | pos           | 253        | 182/104         |
|                        |                                                       |                      |                                        |           | neg           | 251        | 102/208         |
| Pimelic Acid*          | native 2 - 10 ng/ml                                   |                      |                                        |           | neg           | 159        | 97              |
| Piracetam*             | 800 mg oral → 20 µg/ml                                | 15 %                 | 5.2 h                                  |           | pos           | 143        | 126/98/70       |
| Pirenzepine*           | 50 mg oral → 40 ng/ml                                 | 10 %                 | 11 h                                   | 2.1/8.1   | pos           | 352        | 113/70/252      |
| Piroxicam*             | 20 mg oral → 2 µg/ml (usual 2 - 20 µg/ml)             | 99 %                 | 30 - 60 h                              | 2.6       | pos           | 332        | 95/164/121      |
|                        |                                                       |                      |                                        |           | neg           | 330        | 146/131/119     |
| Pramipexole            | (ther: 0.4 - 7.2 ng/mL)                               | 15 %                 | 8 - 12 h                               | 10.3      | pos           | 212        | 153             |
| Prazosin               | 1.5 mg oral → 6 ng/mL                                 | 95 %                 | 2 - 4 h                                | 6.5       | pos           | 384        | 247/95/231      |
| Prednisolone           |                                                       | strong               | 2 - 4 h                                |           | pos           | 361        | 269/92/143      |
| 8-Prenylaringenin*     |                                                       |                      |                                        |           | pos           | 341        | 165/285         |

Pharmacokinetic and Bioanalytical Properties

| Substance       | C <sub>max</sub> -value                                         | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s) |
|-----------------|-----------------------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|------------|-----------------|
| Primidone       | (ther: 5 - 12 µg/mL)                                            | 10 - 20 %            | 10 - 15 h                              |           | pos           | 219        | 91/162          |
| Progesterone    |                                                                 | 96 - 99 %            | 35 - 55 h                              |           | pos           | 315        | 255/215/109/97  |
| Promethazine    | (ther: 100 - 400 ng/mL)                                         | 76 - 93 %            | 5 - 14 h                               | 9.1       | pos           | 285        | 198/86          |
| Propafenone*    | (usual 250 - 1000 ng/ml)                                        | 85 - 95 %            | 5 bzw. 20 h                            | 3.4 / 9   | pos           | 342        | 116/72/324      |
| Propranolol*    | 40 mg oral → 30 ng/ml → >20 ng/ml active (usual 50 - 300 ng/ml) | 90 %                 | 2 - 6 h                                | 9.5       | pos           | 260        | 116/183/155     |
| Propyphenazone* | 300 - 1500 mg daily (usual 1.5 - 3.5 µg/ml)                     | 10 %                 | 1 - 1.5 h                              | 2.0       | pos           | 231        | 189/56/201/77   |
| Ramipril        |                                                                 | 56 % (act. met.)     | 13 - 17 h (act. met.)                  | 3.8/5.2   | pos           | 417        | 234/130/117     |
| Ranitidine      | 150 mg oral → 500 ng/mL (ther: 150 - 250 ng/mL)                 | 15 %                 | 2 - 3 h                                | 2.3/8.2   | pos           | 315        | 176             |
| Repaglinide     |                                                                 | >98 %                | 1 h                                    | 3.7       | pos           | 453        | 230/162/174     |
| Rifampicin      | 600 mg oral → 8 µg/mL (ther: 0.1 - 10 µg/mL)                    | 80 %                 | 2 - 5 h                                | 1.7/7.9   | neg           | 821        | 397/99/789      |
| Risperidone     | (ther: 2 - 10 ng/mL)                                            | 90 %                 | 20 h                                   | 8.8       | pos           | 411        | 191/110         |
| Rivastigmine    | (ther: 1 - 30 ng/mL)                                            | 40 %                 | 1 h                                    | 9.4       | pos           | 251        | 206/86          |
| Roflumilast*    | 0.5 mg oral → 7 ng/ml                                           | 99 %                 | 10 h                                   | 3.5       | pos           | 403        | 187             |
| Ropinireole     | (ther: 0.4 - 6 ng/mL)                                           | 10 - 40 %            | 6 h                                    | 9.8       | pos           | 261        | 114/160/132/86  |
| Rosiglitazone   |                                                                 | 99.8 %               | 3 - 4 h                                | 6.1/6.8   | pos           | 358        | 135/107         |

Pharmacokinetic and Bioanalytical Properties

| Substance                     | C <sub>max</sub> -value                                      | Protein Binding (PB)   | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion                  | Fragment Ion(s)     |
|-------------------------------|--------------------------------------------------------------|------------------------|----------------------------------------|-----------|---------------|-----------------------------|---------------------|
| Roxithromycin                 | 150 mg oral → 7 µg/mL                                        | 96 %                   | 8 - 13 h                               |           | pos           | 837                         | 679/558/540         |
| Salbutamol*                   | 200 ng inhal. → 500 pg/ml (usual 1 - 20 ng/ml)               | low                    | 2 - 7 h                                | 9.3/10.3  | pos           | 240                         | 148/166/222         |
| Salicylic Acid*               | therapeutic 50 - 300 µg/ml                                   | 50 - 90 %              | 2 - 4 h                                | 3.0/13.4  | neg           | 137                         | 93/65/75            |
| Salmeterol*                   | 50 - 200 pg/ml                                               | 93 %                   |                                        | 4.2       | pos           | 416                         | 398/232/91          |
| Scopolamine                   |                                                              |                        | 4.5 h                                  | 7.8       | pos           | 304                         | 138/156             |
| Sertraline                    | (ther: 10 - 150 ng/mL)                                       | 98 %                   | 26 h                                   | 8.6       | pos           | 306                         | 159/275/129         |
| Sildenafil                    |                                                              | 96 %                   | 4 h                                    | 6.0       | pos           | 475                         | 58/100/283          |
| Silbinin = Silymarin*         | 100 mg oral → 110 ng/ml free / total 2500 ng/ml (Glucuronid) |                        | 2.5 h                                  | 1.9       | neg           | 481                         | 301/125             |
| Simvastatin                   |                                                              | 95 %                   | 1.9 h (act. met.)                      |           | pos           | 419                         | 199/267/285/143/169 |
| Spirolactone (act. Canrenone) | 100 mg → 130 ng/mL (ther: 50 - 250 ng/mL)                    | 98 %                   | 13 - 24 h                              |           | pos           | 341                         | 302/263             |
| Sulfadiazine                  | (ther: max 18 - 27 µg/mL)                                    | 20 - 55 %              | 10 h                                   | 6.5       | pos           | 251                         | 156/92/108          |
| Sulfamethoxazole              | 2000 mg oral → 100 µg/mL (ther: 40 - 60 µg/mL)               | 70 %                   | 6 - 12 h                               | 5.6       | pos           | 254                         | 156/92/108          |
| Sumatriptan                   |                                                              | 14 - 21 %              | 2 h                                    | 9.4/11.2  | pos           | 296                         | 58/156/157          |
| Tacrolimus                    | (ther: Blood 5 - 20 ng/mL)                                   | 99 % (80 % Eryth-roc.) | 43 h (blood)                           |           | pos           | 821 (M+NH4)<br>826 (M + Na) | 768/576<br>616/506  |

Pharmacokinetic and Bioanalytical Properties

| Substance                   | C <sub>max</sub> -value                         | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value     | Ionization MS | Parent Ion | Fragment Ion(s) |
|-----------------------------|-------------------------------------------------|----------------------|----------------------------------------|---------------|---------------|------------|-----------------|
| Tamoxifen                   | (ther: 20 - 290 ng/mL)                          | strong               | 7 days                                 | 9.4           | pos           | 372        | 72/45/129       |
| Temazepam*                  | 20 mg oral → 700 ng/ml (usual 200 - 800 ng/ml)  | 97 %                 | 3 - 38 h                               | 1.6           | pos           | 301        | 225/177/193     |
| Terbutaline                 | 5 mg oral → 3 ng/mL                             | 15 - 25 %            | 3 - 4 h                                | 8.8/10.1/11.0 | pos           | 226        | 152/107/125     |
| Testosterone                |                                                 | 80 %                 | 10 - 100 min                           |               | pos           | 289        | 97/109          |
| Tetracycline                | (ther: 1 - 5 µg/mL)                             | 20 - 65 %            | 8 h                                    | 8.3/10.2      | pos           | 445        | 154/410/427     |
| Tetrazepam                  | 50 mg oral → 570 ng/mL (ther: 100 - 600 ng/mL)  | 70 %                 | 10 - 25 h                              |               | pos           | 289        | 225/197/253     |
| Theobromine                 |                                                 |                      | 5 - 11 h                               | 9.3           | pos           | 181        | 138/163         |
| Theophylline*               | (usual 8 - 20 µg/ml)                            | 56 %                 | 3 - 13 h                               | <1/8.6        | pos           | 181        | 124/81/69       |
| Tolbutamide                 | 500 mg oral → 50 µg/mL (ther: 40 - 250 µg/mL)   | 95 %                 | 4 - 7 h                                |               | pos           | 271        | 74/155          |
| Tolperisone* (+Enantiomers) | 300 mg oral → 300 ng/ml                         | 90 %                 | 2.5 h                                  | 3.7           | pos           | 246        | 55              |
| Topiramate                  | (ther: 2 - 8 µg/mL)                             | 9 - 17 %             | 21 h                                   |               | pos           | 340        | 80/251          |
| Tramadol*                   | 50 mg retard → 70 ng/ml (usual 300 - 900 ng/ml) | <5 %                 | 6 h                                    | 8.3           | pos           | 264        | 58/42           |
| Triamcinolone               |                                                 | 68 %                 | 2 - 5 h                                |               | pos           | 395        | 357/225/185     |
| Triamterene*                | 50 mg oral → 60 ng/ml                           | 45 - 70 %            | 2 - 4 h                                | 6.2           | pos           | 254        | 237/104/195     |
| Triazolam                   | (ther: 2 - 20 ng/mL)                            | 80 - 90 %            | 1.5 - 5.5 h                            |               | pos           | 343        | 239/308/315     |

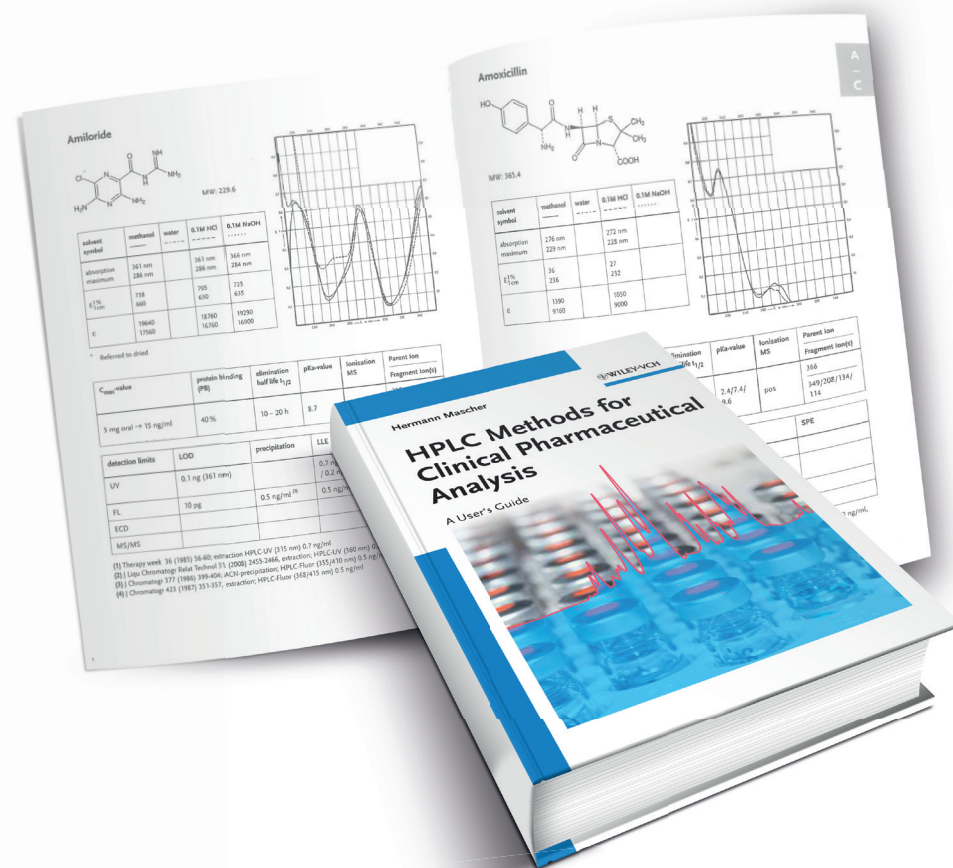
## Pharmacokinetic and Bioanalytical Properties

| Substance                    | C <sub>max</sub> -value                                              | Protein Binding (PB) | Elimination Half Life t <sub>1/2</sub> | pKa-value | Ionization MS | Parent Ion | Fragment Ion(s) |
|------------------------------|----------------------------------------------------------------------|----------------------|----------------------------------------|-----------|---------------|------------|-----------------|
| Trimethoprim                 | 100 mg oral → 1 µg/mL<br>(ther. 1.5 - 2.5 µg/mL)                     | 40 - 70 %            | 8 - 17 h                               | 6.6       | pos           | 291        | 261/230/123     |
| Tryptophan*                  | usual up to 16 µg/mL                                                 |                      |                                        | 2.4/9.4   | pos           | 205        | 188/146/118     |
| Urapidil                     |                                                                      | 80 %                 | 4.7 h                                  |           | pos           | 388        | 205/190/196     |
| Valnemulin*                  |                                                                      |                      |                                        | 4.3       | pos           | 566        |                 |
| Valsartan                    | (ther. max 1.3 - 5.1 µg/mL)                                          | 95 %                 | 5 - 9 h                                | 4.4       | pos           | 436        | 306/235/291     |
| Vancomycin                   | (ther. 10 - 40 µg/mL)                                                | 55 %                 | 3 - 13 h                               | 3.0/9.9   | pos           | 1448       | 1305/1143/144   |
| Verapamil*                   | 40 mg oral → 60 ng/mL<br>>100 ng/mL active<br>(usual 50 - 750 ng/mL) | 90 %                 | 2 - 7 h                                | 4.8       | pos           | 455        | 165/150/303     |
| Vigabatrin                   | (ther. 2 - 10 µg/mL)                                                 | low                  | 5 - 8 h                                | 4.6/9.9   | pos           | 130        | 71/67           |
| Vitamin B 1*<br>(Thiamine)   | 200 mg oral → 30 ng/mL<br>2 - 13 ng/mL native level                  |                      |                                        | 4.8       | pos           | 265        | 122/144/81      |
| Vitamin B 2*<br>(Riboflavin) | native level<br>30 - 150 ng/mL                                       |                      |                                        |           | pos           | 377        | 228/198/170     |
| Vitamin B 6*<br>(Pyridoxal)  | 40 mg oral → 200 ng/mL<br>5 - 24 ng/mL native level                  |                      |                                        |           |               | 170        | 134/152/77      |
| Vitamin E*<br>(Tocopherol)   | 5 - 20 µg/mL                                                         |                      |                                        | 12.2      | pos           | 431        | 165             |
| Zolmitriptan                 |                                                                      | 25 %                 | 2.5 - 3 h                              | 9.6       | pos           | 288        | 58/167/182      |
| Zolpidem                     |                                                                      | 92 %                 | 2.5 h                                  | 5.7       | pos           | 308        | 235/263/219     |

## Do you need more detailed data?

More elaborate data of the substances compiled in this leaflet marked by (\*) are displayed in the book:

„HPLC Methods for  
Clinical Pharmaceutical Analysis“,  
Wiley-VCH, by Hermann Mascher.



## Elaboration

### Short Description of Parameters

Here you find most important information about substances often used in clinical analysis. Most of these determinations are self-approved.

You find rough MS data and published bioanalytical methods (our own and published) with determination limits. Furthermore, remarks on oral dosages and resulting  $C_{\max}$  values, pKa values, remarks on protein binding (PB) and elimination half-life ( $t_{1/2}$ ). But care should be taken, all remarks are rough estimations (sometimes a mixture of different citations) and not suitable for citation! These data are benchmarks to get a feeling for that substance, in particular to know the concentration range your method should reach. The oral dosages and the resulting  $C_{\max}$  values are rough estimations of cited mean concentrations from different bioavailability studies, cited literature or our own results from studies. Sometimes dosages are low, sometimes high, some tablets for instance should be applied four times a day, some only once a day (partly no matter concerning half-life of the active ingredient). Also, the elimination half-life is a mixture of cited results - sometimes the half-life of distribution phase, sometimes the terminal phase. With some applied methods it is not possible to measure the rather low concentrations of specific substances in the terminal phase. The data differ partly considerably: In one case we found in literature half-lives of 2-30 h. Sometimes these are results from volunteers and sometimes from patients. Even pKa values sometimes were variable in literature depending on the source. Exemplarily, we want to show you how helpful these data can be:

Example: Amoxicillin

| Substances  | $C_{\max}$ -value        | Protein Binding (PB) | Elimination Half Life $T_{1/2}$ | pKa-value   | Ionization MS | Parent Ion | Fragment Ion(s) |
|-------------|--------------------------|----------------------|---------------------------------|-------------|---------------|------------|-----------------|
| Amoxicillin | 500 mg oral<br>→ 8 µg/ml | 20 %                 | 1 h                             | 2.4/7.4/9.6 | pos           | 366        | 349/208/134/114 |

a. ) Information: **500 mg oral** results in a  $C_{\max}$  of 8 µg/mL plasma.

Insight: A method for checking compliance (if necessary for such a drug) should be able to measure 1/10 of  $C_{\max}$  - this means 0.8 µg/mL. As a consequence, using UV detection, you have to inject 1 µL plasma (or the extract of 1 µL) onto the column. This should not be a problem!

b. ) Information: **The elimination half-life** is around 1 h.

Insight: A lot of drugs have the  $C_{\max}$  value after 1-3 h after oral ingestion. We didn't want to make more precise remarks because of the huge variability: depending on the galenic formulation, depending on the patient, depending on being sober or after a meal (also depending on high or low fat content of the food).

In this case we know that 3-5 h after (scheduled!) ingestion you should find the  $C_{\max}$  value or for instance a value of four times lower the half-life: for example  $C_{\max}$  at 1 h blood drawing after 5 h =  $4 \times t_{1/2}$  (= 1 h for amoxicillin). This means at 8 µg/mL at last (4/2/1/0.5) 0.5 µg/mL. If we compare this value with the scheduled determination limit of 0.8 µg/mL, then you really could be stressed! Either you look more closely at the pharmacokinetic profile of the used galenic formulation (you should get this from the distributor) or you ask the medical doctor to draw blood after about 2 and 4 h after ingestion. The other chance is to develop a more sensitive method down to 0.1 µg/mL. By having a half-life of 20 h for a given substance it would be enough to await the absorption time and then draw blood within 10-20 h after ingestion.

c. ) Information: **Protein binding (PB)** is 20%.

Insight: The cited levels concerning protein binding can help you avoid some mistakes during sample preparation. For amoxicillin (PB 20%) you can't use protein precipitation with acids (e.g. TCA or HClO<sub>4</sub>). In this case you would lose these 20%. If the protein binding is very similar from patient to patient you could even accept the loss of 20%. But there are a lot of drugs with a high variability in protein binding from patient to patient. If a molecule has a protein binding of 80-100% it is pointless to use protein precipitation with acids. For highly protein bound molecules often a protein precipitation with acetonitrile, methanol, ethanol or acetone is suitable (getting high recovery).

d. ) Information: **pKa value 2.4/7.4/9.6**

Insight: What could be the message for an analyst? You can see that you have acidic or basic groups in the molecule (please check carefully the molecular structure!). This knowledge should influence your thoughts concerning sample preparation and HPLC analysis. From the pKa values you know when a substance is undissociated or dissociated. This influences the solubility in different solvents dramatically and also the chromatographic behavior under different pH conditions. In addition, it could be helpful through pH change to influence the protein binding and also the recovery in relation to plasma or tissue proteins. Substances with two or more pKa values are not seldom amphoteric (please look at the molecular structure!). Concerning substances with four pKa values like Tetracycline you should see a lot of problems coming! Amoxicillin has three pKa values: 2.4 (-COOH)/7.4 (-NH<sub>2</sub>)/9.6 (-phenolic group). The stability of such a molecule often depends on the pH. Chromatography on RP needs undissociated molecules or ion pairs. In this specific case you could stay below pH 9 (because of the phenolic group), between pH 8-9 because of the amino group or as an ion pair with -COOH higher pH 3-4. Reality often looks a little different, but as a rough rule the pKa values are helpful for chromatography. Also for LLE the pKa values are important to determine: You can only extract (enough lipophilic) molecules undissociated into organic (hydrophobic) solvents. Dissociated molecules even if they are lipophilic solve in water phase or buffer.

It is a pity but we could not find pKa values for all substances in literature. No pKa value cited does not necessary mean that the substance has no functional group in this direction. Prof. Ulrich Jordis (TU-Vienna, Institute of Applied Synthesis) supported me with a lot of missing pKa values from literature.

**MS-Information**

e. ) Ionisation MS: either pos = positiv or neg = negativ.

The ionisation mode used for these citations (often found in literature even own experience) was gained by ESI or APCI. For ionic substances often ESI was applied. For lipophilic, neutral substances often APCI was applied.

f. ) Parent Ion and Fragment Ion(s): The parent ion is usually the quasi molecular ion (H<sup>+</sup> or H<sup>-</sup>), sometimes an adduct ion or an ion after loss of water or ammonia.

The fragment ions usually were gained by MRM in tandem mass spectrometers, seldom by ion trap systems. The fragment ions are ordered by signal intensity. They can also occur in single quad systems using collision induced dissociation in the ion source (use of higher voltage).

The determination of substances listed shows our solutions during the last 30 years, as well as data from books and original literature.

During the years we especially used systems from AB Sciex (API 3000 / API 4000 / API 5000) for quantitation and from Thermo Scientific (LCQ Deca and LTQ-Orbitrap XL) for structural elucidation. These systems are not the ones a lot of analysts use and therefore they may not solve their analytical questions in this way. Therefore HPLC-UV, HPLC-ECD, HPLC fluorescence or HPLC fluorescence after derivatization could be helpful for your routine work.

The whole range of antiasthmatic drugs, however, forms an exception. Applying a maximum of 500 pg of substance in an inhalative application leads to such low plasma levels that you need the most sensitive MS/MS systems that are nowadays on the market. Furthermore, substances with no chromophore and functional group for derivatization are also an exception if they are applied lower than 10-50 mg per person orally. Also, substances with a very high first pass can lead to such low levels of parent drug in plasma that you don't have any chance without MS/MS.

But one point should still be kept in mind: There are some volatile substance classes where GC with FID, MS or MS/MS is the method of choice. TLC is a good method but for quantitation or very sensitive determination HPLC is much better. Concerning side products or even sometimes quantifying metabolites TLC could be a good option. After separation (all substances between R<sub>f</sub> 0-1) and drying the plate you can choose a lot of derivatization agents for specific functional groups. Sometimes, TLC can also be a complementary method.

#### Sources for the MS-data:

- a) Own spectra
- b) T+K (2008) 75, 149 Guessregen et al.
- c) Anal. Bioanal. Chem (2009) 395, 2521 Dresen et al.
- d) Specific literature

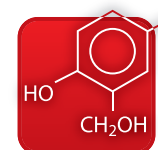
## BIOANALYTICAL SERVICE AND RESEARCH PROVIDER

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### QUANTIFICATION

Small Molecules  
Peptides  
PEGylated Molecules  
Liposomes



### IDENTIFICATION

Structure Elucidation  
Metabolite Profiling  
Impurities  
Degradation Products



### INVESTIGATION

Feasibility Studies  
Tissue Analysis  
Protein-Binding  
Trouble Shooting



### BIOMARKERS

Biomarker Identification:  
Small Molecules in Plasma  
Peptides in Plasma

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