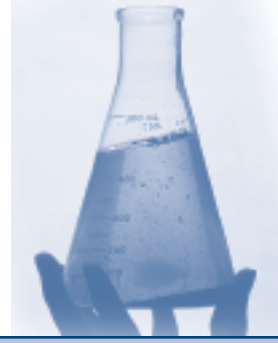


# LAB NOTES



## The Value of TDM

Therapeutic drug monitoring (TDM) is the measurement of plasma or blood concentrations of a given drug and/or its active metabolite(s) in order to adjust dosage regimens to achieve a desired clinical effect and avoid toxic effects.<sup>1</sup> Whenever a patient's medication regimen is changed or when physiologic changes occur, TDM is very important in helping to (re)establish the correct dosage. TDM is of particular value when dealing with drugs that display interpatient variability or that are subject to multiple drug interactions. TDM is not necessary for every medication but is important when there is an association between plasma concentrations and therapeutic effect. For these drugs there is an optimal concentration (therapeutic range) in which patients will achieve the desired therapeutic response.<sup>2</sup> Toxic side effects may occur when concentrations exceed the upper limit of this range.<sup>1</sup> When a drug regime is initiated the plasma concentration rises to a peak concentration and falls to trough value before the next dose. In general, TDM should not be performed until plasma drug concentrations have reached steady-state in the patient.<sup>3</sup> Steady-state occurs when drug input and drug elimination (ie., metabolism and /or excretion) are equilibrated.<sup>1</sup> Drug concentrations reach a plateau or steady-state level after approximately five and one-half half-lives.<sup>1</sup> (The half-life of a drug is the time necessary for the drug concentration to reach one-half of its peak concentration. Reference-drug half-lives from a Physicians Desk Reference.)

Example using gentamicin (Half-life is 2-3 hours):

How long after starting gentamicin should TDM begin? Answer: 11-16.5 hours

How long does it take to eliminate gentamicin after discontinuing medication? Answer: 11-16.5 hours

(The answer to both questions is five and one-half times the half-life of the drug.<sup>1</sup>)

Once steady-state is reached, both the peak and trough levels fall within the therapeutic range.<sup>2</sup> Because there is a small change in concentration with time during the trough phase of metabolism, it's easier to establish therapeutic ranges using trough rather than peak samples. The rule of thumb for proper time of collection for TDM of most drugs is immediately before the next dose; almost all therapeutic ranges were established using trough values. For peak levels, samples should be collected 60-90 minutes following intramuscular injection and 30-60 minutes after completion of an intravenous infusion (ref. doctor's orders or corporate policy for specific time).<sup>1</sup>

Interpretation of TDM results should include consideration of many factors. The patient's age, disease condition and any factor affecting drug absorption, distribution, metabolism, excretion, and the route of administration (oral, intramuscular, intravenous, etc.) influence drug concentrations.<sup>1</sup> Therapeutic drug monitoring with the above considerations can be very helpful in patient management by helping to achieve the desired therapeutic effect and avoid adverse effects.

HHLA can help with your patient's TDM by performing drug testing for the commonly monitored drugs (anticonvulsants, cardioactive drugs, bronchdilators, antibiotics, psychotropics, and immunosuppressants) and reporting results in a trended report. Please call us if you have questions about the color of tube required for your specific drug order.



The Lab-in-a-Box®

- 1) Advance for Administrators of the Laboratory. "The Value of TDM. Toxicology" by Larry Broussard PHD, and Victor Tuckler MD pgs. 33-43.
- 2) Pharmacokinetics made easy 1,2 "Therapeutic Drug Monitoring" by D.J. Birkett pgs.1-5 [www.australianprescriber.com](http://www.australianprescriber.com)
- 3) "Therapeutic Drug Monitoring" by Dawn Merton Boothe DVM,MS, PhD, pgs.1-9 [www.cvm.tamu.edu](http://www.cvm.tamu.edu)