

# Understanding Elimination Patterns with Creatinine Adjusted Values

## The Importance of Creatinine Adjustment

Creatinine is a product of muscle contraction. Because it is produced from within and released into body fluids at a relatively constant rate, the level of creatinine in urine may be used as an indication of body hydration. Since measured drug levels can fluctuate with the level of creatinine, a key aspect of your laboratory testing is creatinine adjustment. With creatinine adjusted drug levels, you can better monitor drug usage and redefine program goals to increase treatment effectiveness. Creatinine adjusted values are for clinical pharmacokinetic comparison only; these values are not intended for forensic or punitive use.

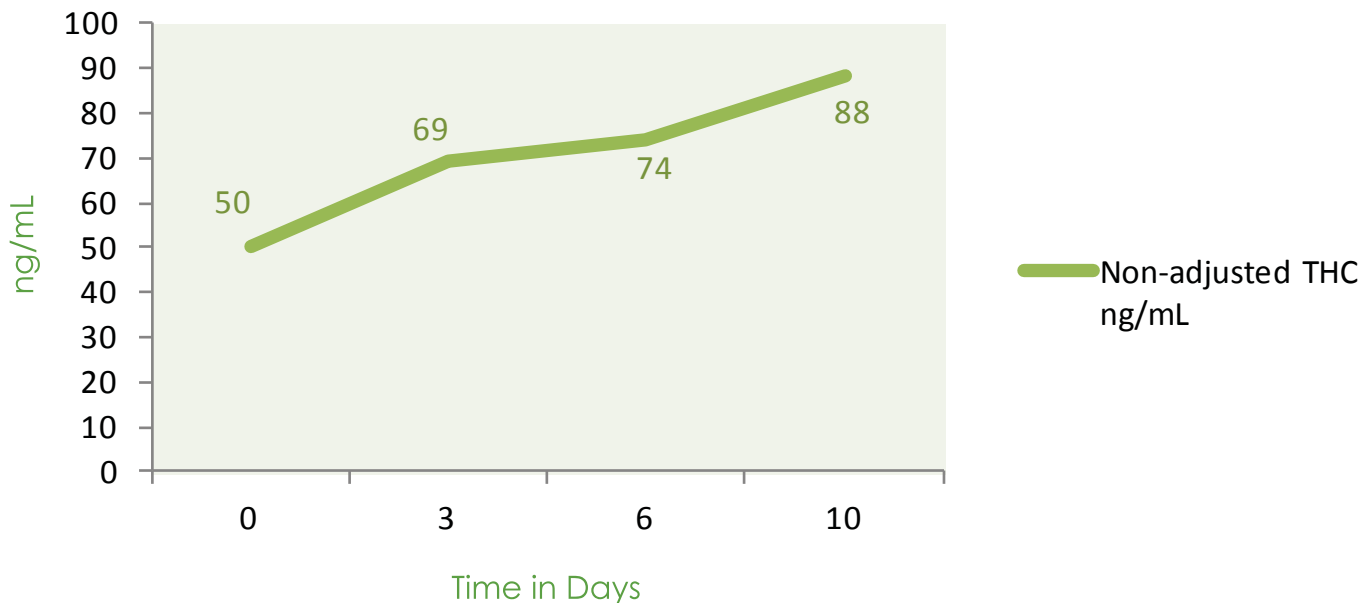
## Creatinine Adjustment in Action: A Case Study

John, 32, was admitted to ABC Rehab for inpatient treatment for his chronic marijuana addiction. Upon intake, his clinician ordered a urine drug test to establish a baseline from which John's treatment planning could begin. After reviewing the initial results, the clinician determined a random frequency of monitoring would be best in John's case. John was again tested on the third, sixth, and tenth days post admission.

### Scenario A: Testing Results Without Creatinine Adjustment

When plotted, John's test results illustrate a steady increase over time, indicating what looks to be continuous marijuana usage (see Exhibit A). When the clinician approaches John about usage, John gets defensive and insists he is abstaining.

Exhibit A



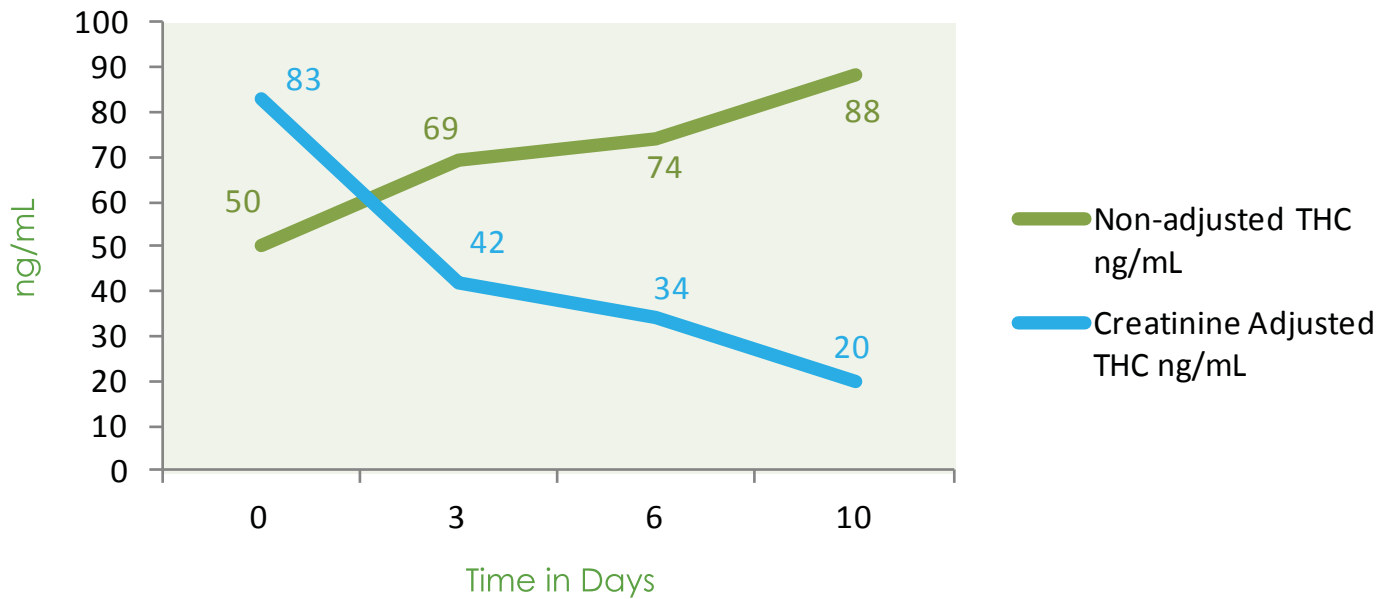
### Scenario B: Testing Results With Creatinine Adjustment

John's urine creatinine levels indicate subsequently more concentrated urines on the third, sixth, and tenth days post admission. John's creatinine-adjusted THC test results show a steady decrease in THC levels, indicating a gradual elimination of cannabinoids over time (see Exhibit B).

When the clinician reviews the test results with John to show his THC levels are decreasing over time, there is an immediate

sense of reassurance that John's treatment is effective thus far. In the coming weeks, John shows increased involvement in his treatment program.

Exhibit B



### Calculating for Confidence in Results

The Creatinine Adjustment Formula is:

$$\frac{\text{DIRECTLY MEASURED DRUG LEVEL} \times \text{AVERAGE CREATININE EXCRETED (100 mg/dL)}}{\text{DIRECTLY MEASURED CREATININE LEVEL}} = \text{CREATININE ADJUSTED DRUG LEVEL}$$

### Applying the Formula in John's Case

John on admittance has a measured value for THC = 50 ng/mL. John's measured Creatinine level = 60.2 mg/dL. When applying the creatinine adjustment formula, the creatinine adjusted THC value is 83 ng/mL (50 ng/mL x 100 mg/dL ÷ 60.2 mg/dL = 83 ng/mL). On the third, sixth and tenth days post admission, John's directly measured THC levels are 69, 74, and 88 ng/mL respectively in the urine and John's creatinine levels are 164, 220 and 440 mg/dL, subsequently more concentrated urines. When the calculations are performed, the creatinine adjusted levels of THC are 42, 34 and 20 ng/mL respectively. The creatinine adjusted values indicate gradual elimination of cannabinoids.

**Reference:** Fraser AD, Worth D. Urinary excretion profiles of 11-nor-9-carboxy-Delta9-tetrahydrocannabinol: a Delta9-THC-COOH to creatinine ratio study #2. Forensic Sci Int. 2003 Apr 23;133(1-2):26-31.

