VERIDANE LABORATORIES • QUALITY CONTROL

STB-PRT-022: How the Stability Study Sets a Shelf Life

Metrafen 800 mg film-coated tablets • HDPE bottle of 60

Rev 3 • Effective 01 October 2026 • Owner: QC Stability • Approved: Head of Quality

1 Purpose

A shelf life is a promise: every tablet still meets its specification on the last day printed on the label. This summary explains how the stability study for Metrafen 800 mg tablets collects the evidence for that promise and how the shelf life is calculated from it, following ICH Q1A(R2) and Q1E.

2 Storage conditions

Three primary batches in the market pack are stored in qualified chambers.

Study	Condition	Pulls (months)
Long-term	25 °C / 60% RH	0, 3, 6, 9, 12, 18, 24, 36
Intermediate	30 °C / 65% RH	only if accelerated fails
Accelerated	40 °C / 75% RH	0, 3, 6

Table 1: Stability conditions and pull points. Chambers hold ±2 °C and ±5% RH.

3 What is tested at each pull

Test	Acceptance criterion
Assay (Metrafen)	95.0–105.0% of label claim
Total impurities	$\leq 1.0\%$
Dissolution	Q $= 80\%$ in 30 minutes
Water content	$\leq 3.0\%$
Appearance	White, oval, unbroken

Table 2: Specification checked at every pull.

> **Significant change** at the accelerated condition means a 5% change in assay from the start, or any test failing its criterion. If it happens, the intermediate study starts.

4 The results so far

All three batches pass every test at every pull. Assay falls slowly and evenly; it is the attribute that limits the shelf life. Batch B2 has the steepest slope and is used below.

Month	0	3	6	9	12	18	24
Assay %	100.4	100.0	99.7	99.3	99.0	98.3	97.6

Table 3: Batch B2, long-term condition (25 °C / 60% RH).

At 40 °C / 75% RH the same batch read 100.4%, 99.5% and 98.7% at 0, 3 and 6 months: a change of 1.7%, so **no significant change**.

5 How the shelf life is calculated

A straight line is fitted through the long-term assay results:

$$\text{Assay}(t) = a + b\,t$$

with $a = 100.38\%$ and $b = -0.116\%$ per month. The shelf life is the time at which the *lower one-sided 95% confidence bound* of that line reaches the 95.0% limit, not the line itself: the bound allows for the scatter in the data.

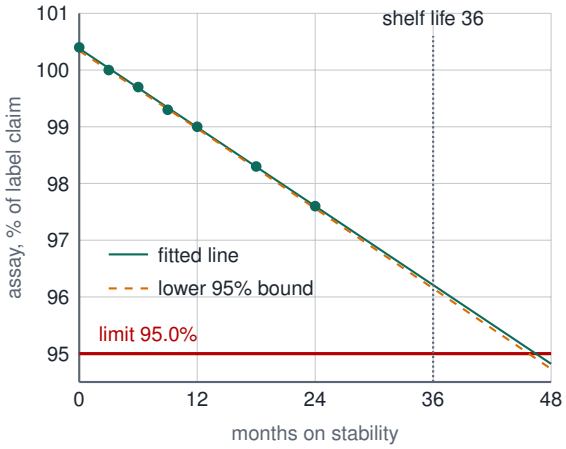


Figure 1: Batch B2 assay, fitted line and its lower 95% confidence bound.

Month	24	36	42	48
Fitted assay %	97.60	96.21	95.52	94.82
Lower 95% bound %	97.56	96.15	95.44	94.73

Table 4: Where the line and its bound are heading.

The lower bound reaches 95.0% at about **45.7 months**.

6 The extrapolation limit

With 24 months of real data, ICH Q1E allows the shelf life to go beyond what was measured only if the accelerated study shows no significant change, and then to no more than **twice the data period** and no more than **12 months beyond it**:

$$\text{Shelf life} \leq \min(2 \times 24,\ 24 + 12) = 36 \text{ months}.$$

Worked example: the shelf life on the label

The statistics support 45.7 months; the extrapolation limit allows 36. The label takes the smaller: **36 months**. The 36-month pull then confirms it with real data; if it fails, the shelf life is cut and the batches on the market are assessed.

7 After approval

One commercial batch a year joins the long-term study for as long as the product is sold. Any out-of-specification result is reported to the regulator.

> **In one line:** store, test on schedule, fit the line, find where its lower 95% bound meets the limit, then cap it at the extrapolation limit.