Lessons Learned from a Novice HIV Pharmacist

HIV Pharmacy Education Day 2025
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- **About me:**
  - Community Pharmacist – Prime Care Pharmacy
  - HIV Pharmacy Consulting – Hive Health Services

- **Goal:**
  - Share a real-world case to build foundational skills in HIV care
  - Designed for those newer to HIV practice

- **Focus:**
  - Where to start, what resources to use, how to find information

Pharmacy Consult:

Can you assess for regimen simplification?

Patient VS

- 53 year old, cisgender female
- HIV History → HIV+ 1996 (life insurance required test)
- Allergies → Nevirapine (Stevens-Johnson Syndrome)
- Drug Coverage → private plan

Medications

- progesterone 100mg daily
- estradiol 1mg daily
- Genvoya (FTC/TAF/EVG/cobi) one tablet daily
- darunavir 800mg daily
- recently stopped rosuvastatin 10mg daily

Lesson 1

The Power of a Good ARV History

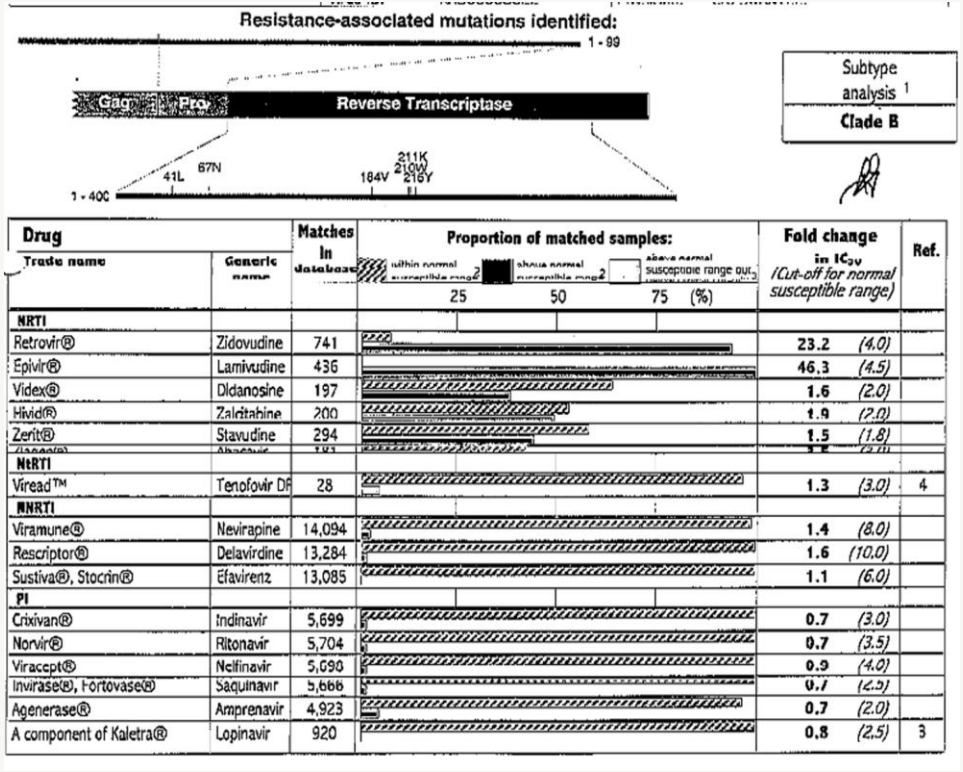
DATE	REGIMEN	COMMENTS
1996 - 1998	AZT + ddi	
1998	d4T + 3TC +	nson Syndrome secondary to NVP
1998-2003?	d4T, 3TC, SC	second son type
2003-2006?	drug holiday	otype
Dec 2006 - Nov 2007	TDF + 3TC +	
Nov 2007 - Jul 2014	TDF/FTC + S	
Jul 2014 - Jun 2016	DTG + ABC/3TC + DRV 800mg + RTV	
Jun 2016 - Oct 2019	ABC/3TC/DTG + DRV 800mg + RTV	
Oct 2019 - Present	FTC/TAF/EVG/c + DRV 800mg	

Viral load undetectable since March 2007

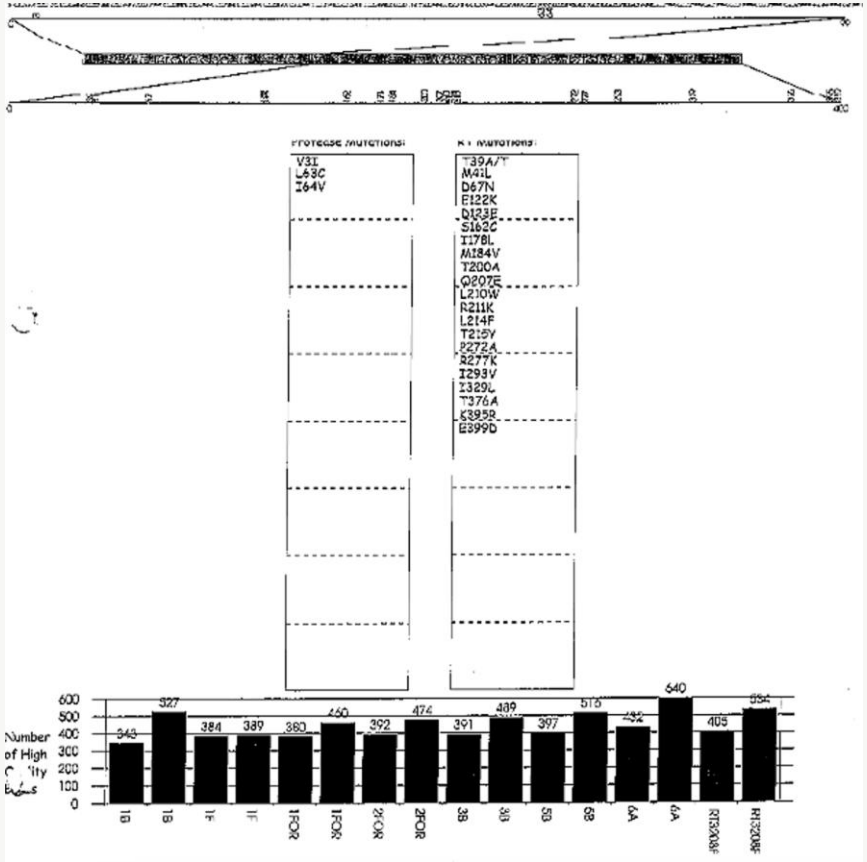
Lesson 2

Understanding Genotypes & Resistance

- Genotypic testing **detects resistance mutations** in relevant viral genes
- Requires viral load ≥ 250 copies/mL
- Mutation shorthand:
  - Example → **M184V**: methionine (M) → valine (V) at position 184
- Mutations help identify reduced ARV susceptibility
- Viral load sample → Public Health Ontario → BCCE for genotyping → Interpretation
- Watch the three part **CHAP 101 Learning Series: Tackling ART Resistance** by Linda Robinson

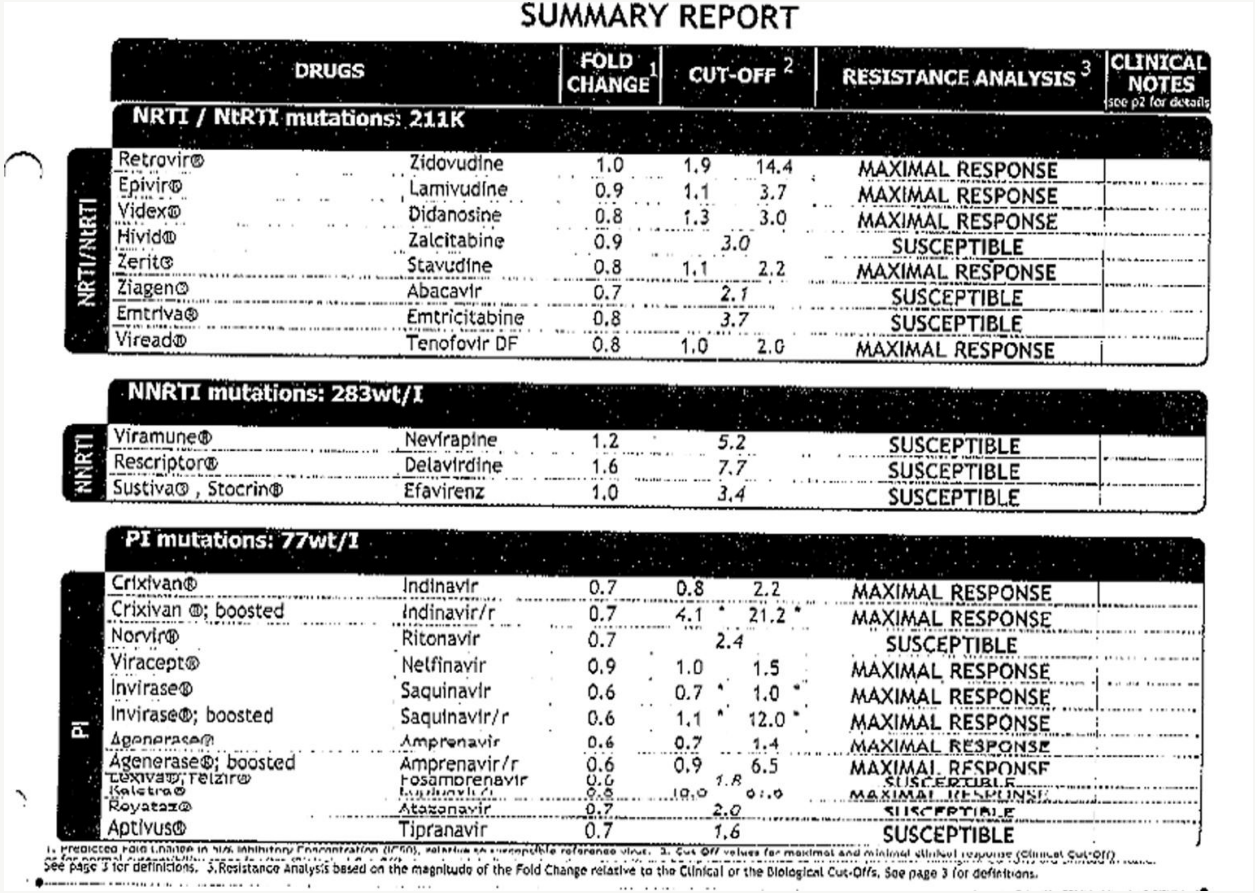


Drug		Matches In database	Proportion of matched samples: (25 / 50 / 75 (%))	Fold change in IC_{50} (Cut-off for normal susceptible range)	Ref.
Trade name	Generic name				
NRTI					
Retrovir®	Zidovudine	741		23.2 (4.0)	
Epivir®	Lamivudine	436		46.3 (4.5)	
Videx®	Didanosine	197		1.6 (2.0)	
Hivid®	Zalcitabine	200		1.9 (2.0)	
Zerit®	Stavudine	294		1.5 (1.8)	
[illegible]	[illegible]	[illegible]		[illegible]	
NtRTI					
Viread™	Tenofovir DF	28		1.3 (3.0)	4
NNRTI					
Viramune®	Nevirapine	14,094		1.4 (8.0)	
Rescriptor®	Delavirdine	13,284		1.6 (10.0)	
Sustiva®, Stocrin®	Efavirenz	13,085		1.1 (6.0)	
PI					
Crixivan®	Indinavir	5,699		0.7 (3.0)	
Norvir®	Ritonavir	5,704		0.7 (3.5)	
Viracept®	Nelfinavir	5,690		0.9 (4.0)	
Invirase®, Fortovase®	Saquinavir	5,666		0.7 (2.5)	
Agenerase®	Amprenavir	4,923		0.7 (2.0)	
A component of Kaletra®	Lopinavir	920		0.8 (2.5)	3



January 5, 1999

NRTI - 41L, 67N, 184V, 211K, 210W, 215Y



SUMMARY REPORT

	DRUGS		FOLD CHANGE [1]	CUT-OFF [2]		RESISTANCE ANALYSIS [3]	CLINICAL NOTES (see p2 for details)
	NRTI / NtRTI mutations: 211K						
NRTI/NtRTI	Retrovir®	Zidovudine	1.0	1.9	14.4	MAXIMAL RESPONSE	
	Epivir®	Lamivudine	0.9	1.1	3.7	MAXIMAL RESPONSE	
	Videx®	Didanosine	0.8	1.3	3.0	MAXIMAL RESPONSE	
	Hivid®	Zalcitabine	0.9	3.0		SUSCEPTIBLE	
	Zerit®	Stavudine	0.8	1.1	2.2	MAXIMAL RESPONSE	
	Ziagen®	Abacavir	0.7	2.1		SUSCEPTIBLE	
	Emtriva®	Emtricitabine	0.8	3.7		SUSCEPTIBLE	
	Viread®	Tenofovir DF	0.8	1.0	2.0	MAXIMAL RESPONSE	
	NNRTI mutations: 283wt/I						
NNRTI	Viramune®	Nevirapine	1.2	5.2		SUSCEPTIBLE	
	Rescriptor®	Delavirdine	1.6	7.7		SUSCEPTIBLE	
	Sustiva® , Stocrin®	Efavirenz	1.0	3.4		SUSCEPTIBLE	
	PI mutations: 77wt/I						
PI	Crixivan®	Indinavir	0.7	0.8	2.2	MAXIMAL RESPONSE	
	Crixivan ®; boosted	Indinavir/r	0.7	4.1 *	21.2 *	MAXIMAL RESPONSE	
	Norvir®	Ritonavir	0.7	2.4		SUSCEPTIBLE	
	Viracept®	Nelfinavir	0.9	1.0	1.5	MAXIMAL RESPONSE	
	Invirase®	Saquinavir	0.6	0.7 *	1.0 *	MAXIMAL RESPONSE	
	Invirase®; boosted	Saquinavir/r	0.6	1.1 *	12.0 *	MAXIMAL RESPONSE	
	Agenerase®	Amprenavir	0.6	0.7	1.4	MAXIMAL RESPONSE	
	Agenerase®; boosted	Amprenavir/r	0.6	0.9	6.5	MAXIMAL RESPONSE	
	Lexiva®; Telzir®	Fosamprenavir	0.6	1.8		SUSCEPTIBLE	
	Kaletra®	Lopinavir/r	0.8	10.0	61.0	MAXIMAL RESPONSE	
	Reyataz®	Atazanavir	0.7	2.0		SUSCEPTIBLE	
	Aptivus®	Tipranavir	0.7	1.6		SUSCEPTIBLE	

1. Predicted Fold Change in 50% Inhibitory Concentration (IC50), relative to susceptible reference virus. 2. Cut Off values for maximal and minimal clinical response (Clinical Cut-Off) as for normal susceptibility, page 3 for definitions. 3. Resistance Analysis based on the magnitude of the Fold Change relative to the Clinical or the Biological Cut-Offs. See page 3 for definitions.

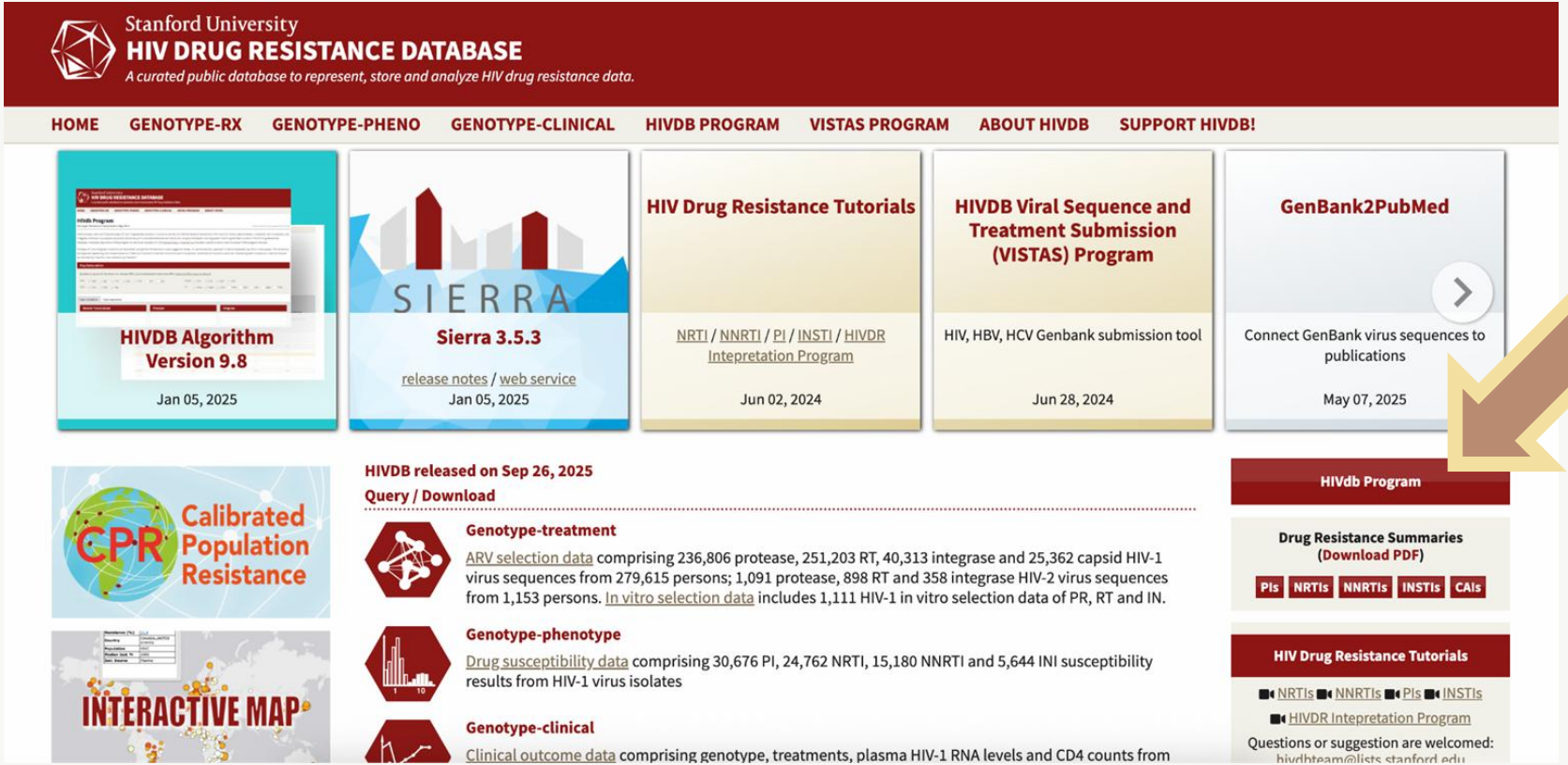
September 27, 2006

NRTI - 211K

NNRTI - 283wt/I

PI - 77wt/I

Stanford Drug Resistance Database



HIVdb Program: Mutations Analysis

HIVdb accepts user-submitted protease, RT, and integrase sequences or mutations and returns inferred levels of resistance to the most commonly used protease, nucleoside, non-nucleoside, and integrase inhibitors. Its purpose is educational and as such it provides extensive comments and a highly transparent scoring system that is hyperlinked to data in the HIV Drug Resistance Database. A detailed description of the program as well as all updates is in the Release Notes. A web service has been created to allow users to access HIVdb programmatically.

New: this program is now available for analyzing SARS-CoV-2 mutations, FASTA, and FASTQ (NGS) sequences.

Protease, RT, and integrase mutations can be entered using either the text box or auto-suggestion boxes. To use the t…x, type each mutation separated by one or more spaces. The consensus wildtype and separating commas are optional. If there is a mixture of more than one amino acid at a position, write both amino amino acids (an intervening slash is optional). Insertions should be indicated by "Insertion" and deletions by "Deletion".

Drug display options

By default, results will be shown for checked ARVs. Use checkboxes for additional ARVs. (select all)

NRTI: ☑ ABC ☑ AZT ☑ FTC ☑ 3TC ☑ TDF ☐ D4T ☐ DDI

NNRTI: ☑ DOR ☑ EFV ☑ ETR ☑ NVP ☑ RPV ☐ DPV

INSTI: ☑ BIC ☑ CAB ☑ DTG ☑ EVG ☑ RAL

PI: ☑ ATV/r ☑ DRV/r ☑ LPV/r ☐ FPV/r ☐ IDV/r ☐ NFV ☐ SQV/r ☐ TPV/r

Input mutations | Input sequences | Input sequence reads

Reverse Transcriptase

M41L x D67N x M184V x R211K x L210W x T215Y x L283I x Enter/paste mutations

40 41 44 62 65 67 68 69
70 74 75 77 90 98 100 101
103 106 108 115 116 118 138 151
179 181 184 188 190 210 215 219
221 225 227 230 234 236 238 318
348

Protease

V77I x Enter/paste mutations

10 11 13 20 23 24 30 32
33 35 36 43 46 47 48 50
53 54 58 63 71 73 74 76
77 82 83 84 85 88 89 90
93

Integrase

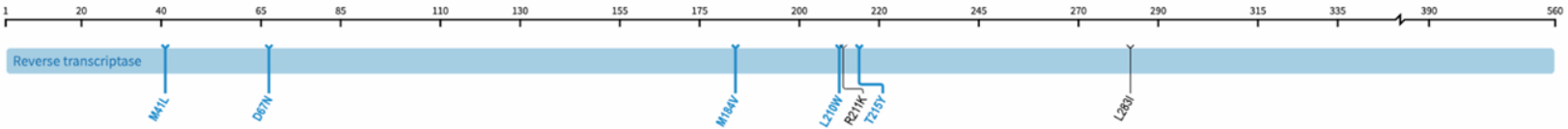
Enter/paste mutations

51 66 74 92 95 97 114 118
121 128 138 140 143 145 146 147
148 149 151 153 155 163 230
232 263

☑ Save input mutations in my browser for future use

Reset Analyze

Reverse transcriptase (RT)



There are no known mutation quality issues.

Drug resistance interpretation: PR

HIVDB 9.8 (2025-01-05)

PI Major Mutations: None
PI Accessory Mutations: None
PR Other Mutations: V77I

Protease Inhibitors	
atazanavir/r (ATV/r)	Susceptible
darunavir/r (DRV/r)	Susceptible
lopinavir/r (LPV/r)	Susceptible

Mutation scoring: PR

HIVDB 9.8 (2025-01-05)

No drug resistance mutations were found for PI.

Drug resistance interpretation: RT

HIVDB 9.8 (2025-01-05)

NRTI Mutations: **M41L** • **D67N** • **M184V** • **L210W** • **T215Y**
NNRTI Mutations: None
RT Other Mutations: R211K • L283I

Nucleoside Reverse Transcriptase Inhibitors	
abacavir (ABC)	High-Level Resistance
zidovudine (AZT)	High-Level Resistance
emtricitabine (FTC)	High-Level Resistance
lamivudine (3TC)	High-Level Resistance
tenofovir (TDF)	High-Level Resistance

Non-nucleoside Reverse Transcriptase Inhibitors	
doravirine (DOR)	Susceptible
efavirenz (EFV)	Susceptible
etravirine (ETR)	Susceptible
nevirapine (NVP)	Susceptible
rilpivirine (RPV)	Susceptible

RT comments

NRTI

- **M41L** is a TAM that usually occurs with T215Y. In combination, **M41L** plus T215Y confer intermediate / high-level resistance to AZT and d4T and contribute to reduced ddI, ABC and TDF susceptibility.
- **D67N** is a non-polymorphic TAM associated with low-level resistance to AZT.
- **M184V/I** cause high-level in vitro resistance to 3TC and FTC and low/intermediate resistance to ABC (3-fold reduced susceptibility). **M184V/I** are not contraindications to continued treatment with 3TC or FTC because they increase susceptibility to AZT and TDF and are associated with clinically significant reductions in HIV-1 replication.
- **L210W** is a TAM that usually occurs in combination with M41L and T215Y. The combination of M41, **L210W** and T215Y causes high-level resistance to AZT and intermediate resistance to ABC and TDF.
- **T215Y/F** are TAMs that causes intermediate/high-level resistance to AZT and potentially low-level resistance to ABC and TDF.

Assessment

- Stanford resistance profile shows **high-level resistance** to the **entire NRTI** class
- **Severe allergy to nevirapine** (SJS) → concern for cross-sensitivity with NNRTIs
- No evidence of NNRTI re-exposure since the reaction → avoid unless no alternatives
- Can we simplify??

Lesson 3

Use Your Community

- CHAP google group → poll the country!
- CHAP observership opportunities
- Expert and experienced colleagues
- Medical liaisons

Alternatives

1

B/F/TAF + DRV/c

- Remains PI-based, two-tablet regimen
- Modernizes integrase inhibitor from EVG → BIC
- Simple, safe, and effective switch

2

B/F/TAF alone

- Use with TAF mutations is off-label
- Canadian study switching to B/F/TAF in the presence of 1-8 NRTI mutations → 98% maintained suppression
    - 2 had same 5 NRTI RAMs; 9 were on same baseline regimen
- Trial with close VL monitoring
- If virologic rebound occurs → add DRV/c

3

DTG/3TC + DRV/c

- PI-based, two-tablet regimen
- Modernizes integrase inhibitor from EVG → DTG
- HBV immunity confirmed

Outcome

- VS met with the physician to discuss simplifying her regimen to B/F/TAF alone
- **VS declined any change**! She reported feeling great with her current regimen and prefers to remain on current therapy due to concerns about tolerating switches
- Valuable learning gained through the case despite no change

Thank you!

Do you have
any comments
or questions?