

Stability of reference cigarettes under different storage conditions

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Background

- **Reference Cigarettes used for research purposes only**
- **CTRP has provided reference cigarettes for 47 years**

Objective

- **To study stability of reference cigarettes under different storage conditions**

3R4F storage condition

- Stored long-term in a freezer (-26°C) at Richmond, Virginia
- Stored in cool room (4°C) at CTRP

Experimental design

➤ Storage conditions

Compare 3 different storage conditions

Cigarettes stored in two zip-lock bags under:

1. -20°C
2. 4°C with 50-60% relative humidity
3. lab ambient temperature and humidity



Experimental design

➤ Test period

*Samples analyzed at different test periods:
0, 1, 2, 3, 6, 9 and 12 months*

Experimental design

➤ Test parameters

Tobacco filler

- TSNAs (NNN, NAT NAB and NNK)
- Alkaloids (nicotine, nornicotine, anabasine and anatabine)
- oven volatiles



Experimental design

➤ Test parameters (continue)

Mainstream smoke analysis under ISO smoking conditions

- TSNAs (NNN, NAT NAB and NNK)
- Alkaloids (nicotine, nornicotine, anabasine and anatabine)
- CO (Carbon monoxide)
- TPM (Total Particulate Matter)

ISO smoking regime

puff volume	Puff frequency	Puff duration	ventilation blocking
mL	seconds	seconds	%
35	60	2	0

Conditioning Chamber

➤ Conditioning atmosphere

$T = 22^{\circ}\text{C}$

$\text{RH}\% = 60\%$



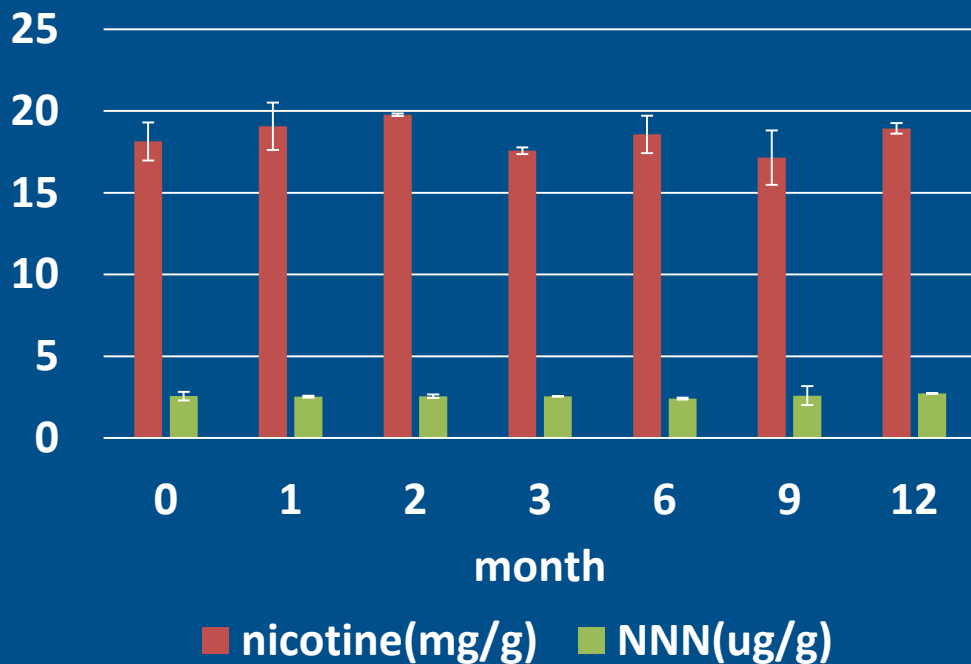
Smoking machine

➤ Cerulean SM450 Linear smoking machine



Tobacco Filler data

➤ Cigarettes stored in freezer

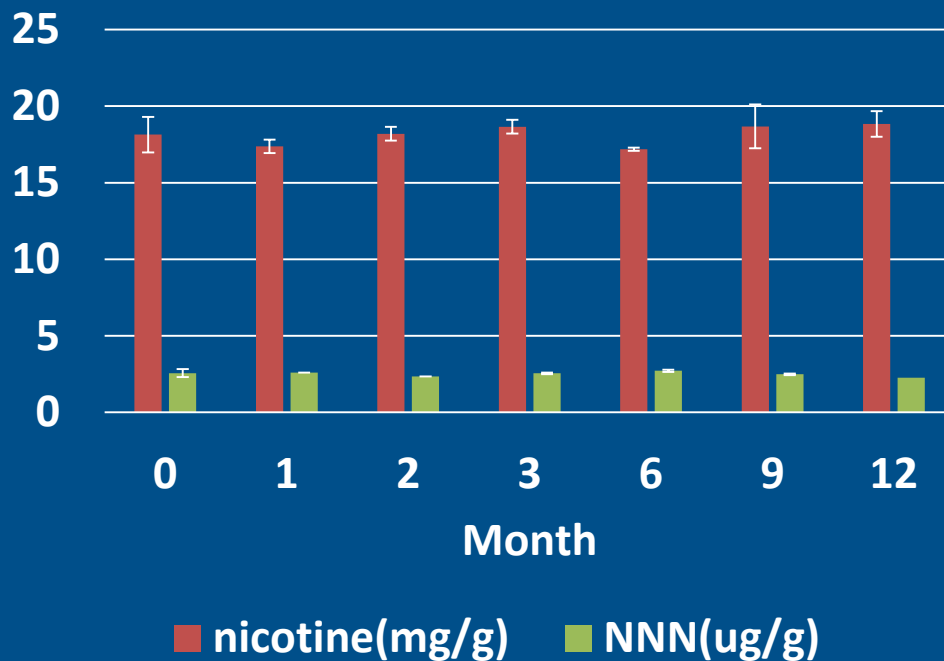


	Initial	14 months
	%	%
Oven volatile	12.70	12.67
CV%	1.7	0.9

	Nicotine	NNN
	mg/g	ug/g
Average	18.46	2.56
CV%	4.9	3.6

Tobacco Filler data

➤ Cigarettes stored in cool room

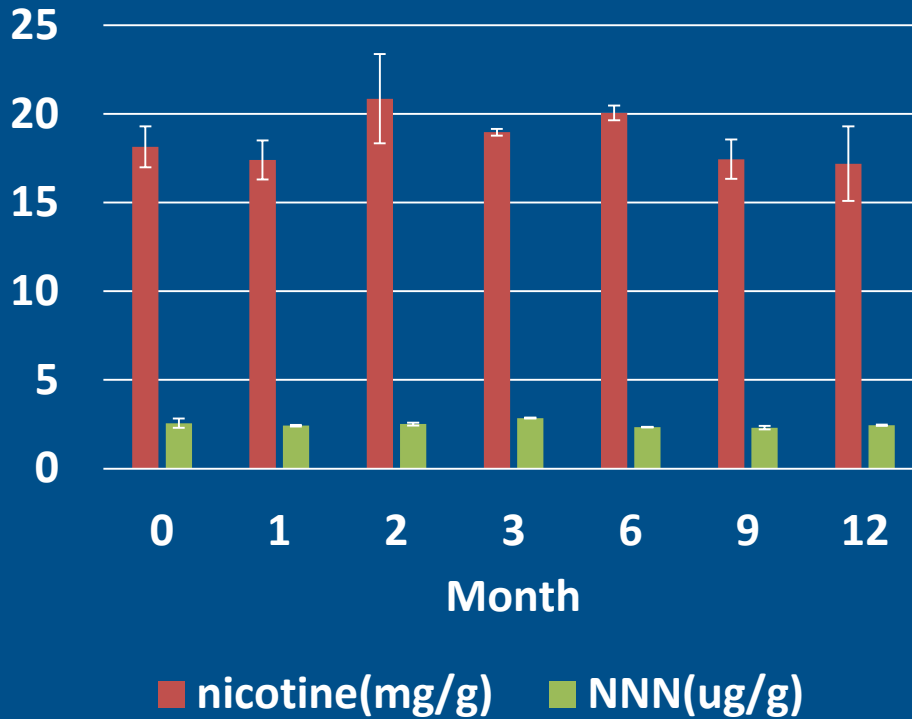


	Initial	14 months
	%	%
Oven volatile	12.70	12.72
CV%	1.7	0.4

	Nicotine	NNN
	mg/g	ug/g
average	18.16	2.50
CV%	3.6	6.2

Tobacco Filler data

➤ Cigarettes stored at room temperature

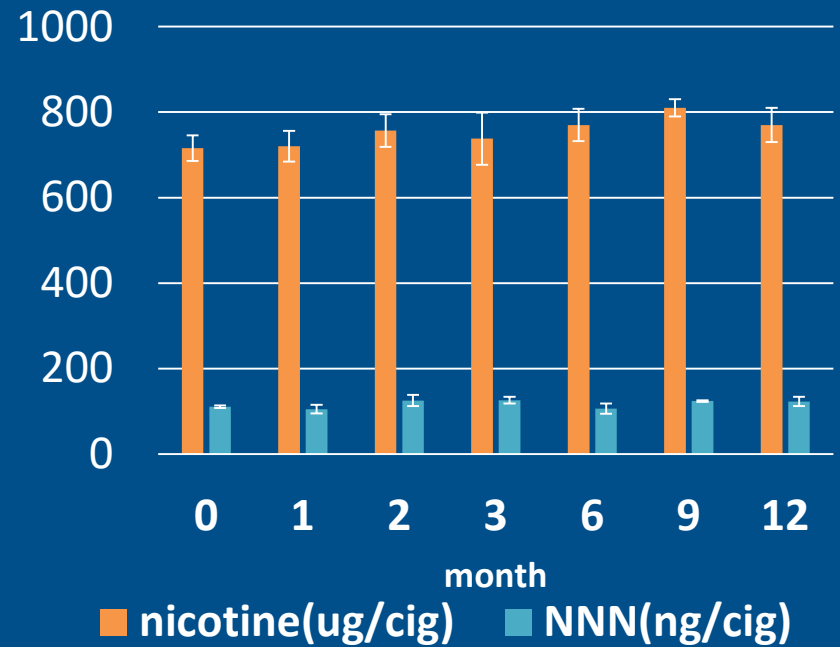
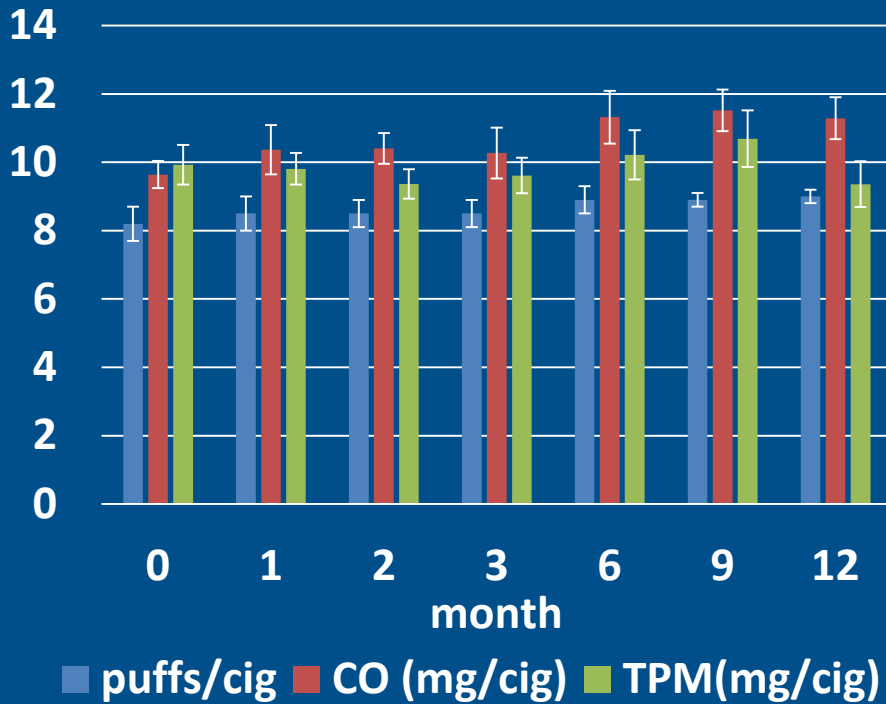


	Initial	14 months
	%	%
Oven volatile	12.70	10.0
CV%	1.7	0.6

	Nicotine	NNN
	mg/g	ug/g
average	18.58	2.49
CV%	7.7	7.3

Smoke data

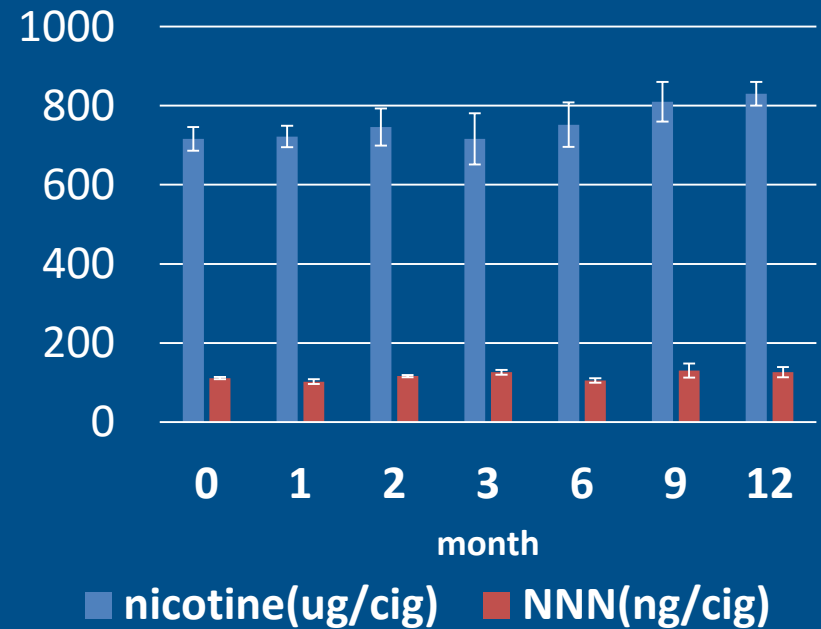
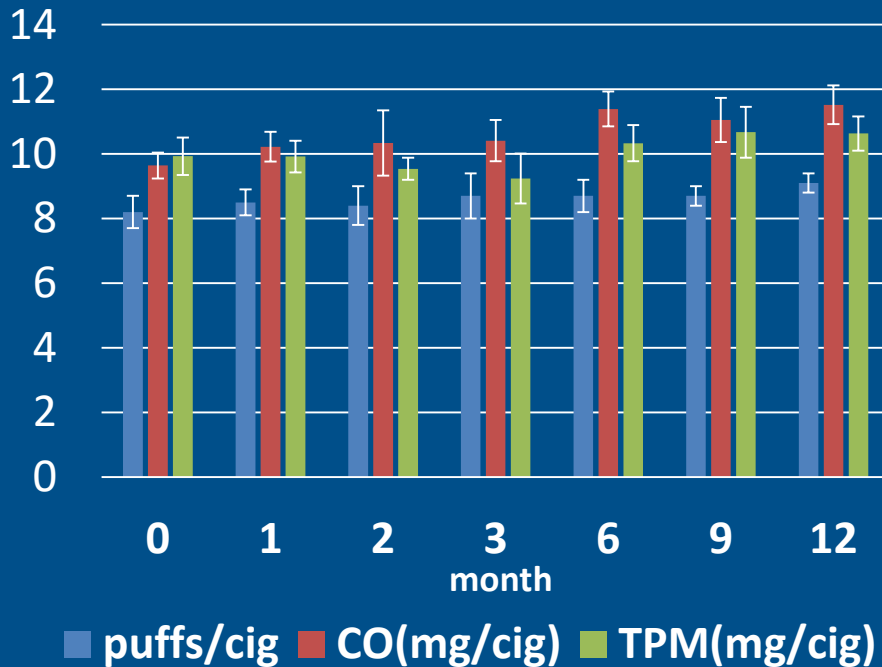
➤ Cigarettes stored in freezer



	Puffs/cig	CO/cig mg/cig	TPM mg/cig	Nicotine ug/cig	NNN ng/cig
average	8.6	10.7	9.9	754	117
CV%	3.4	6.5	4.9	4.4	8.0

Smoke data

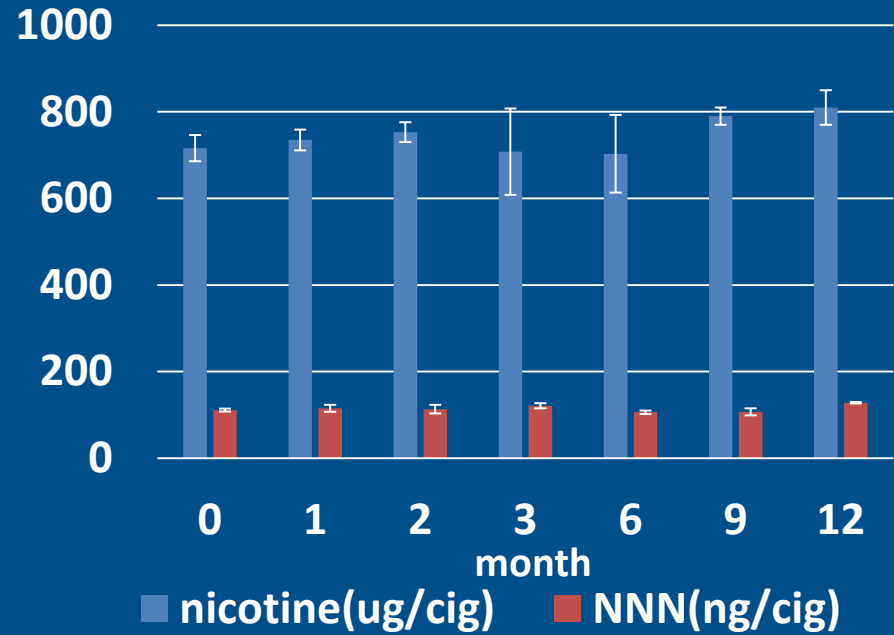
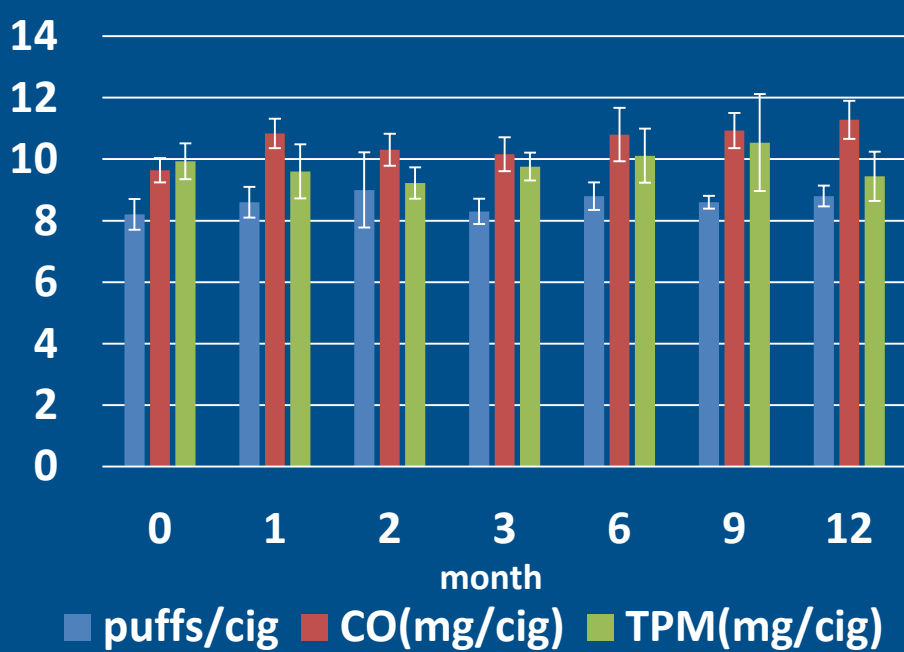
➤ Cigarettes stored in cool room



	Puffs/cig	CO/cig mg/cig	TPM mg/cig	Nicotine ug/cig	NNN ng/cig
average	8.6	10.7	10.0	756	117
CV%	3.3	6.4	5.4	6.1	9.5

Smoke data

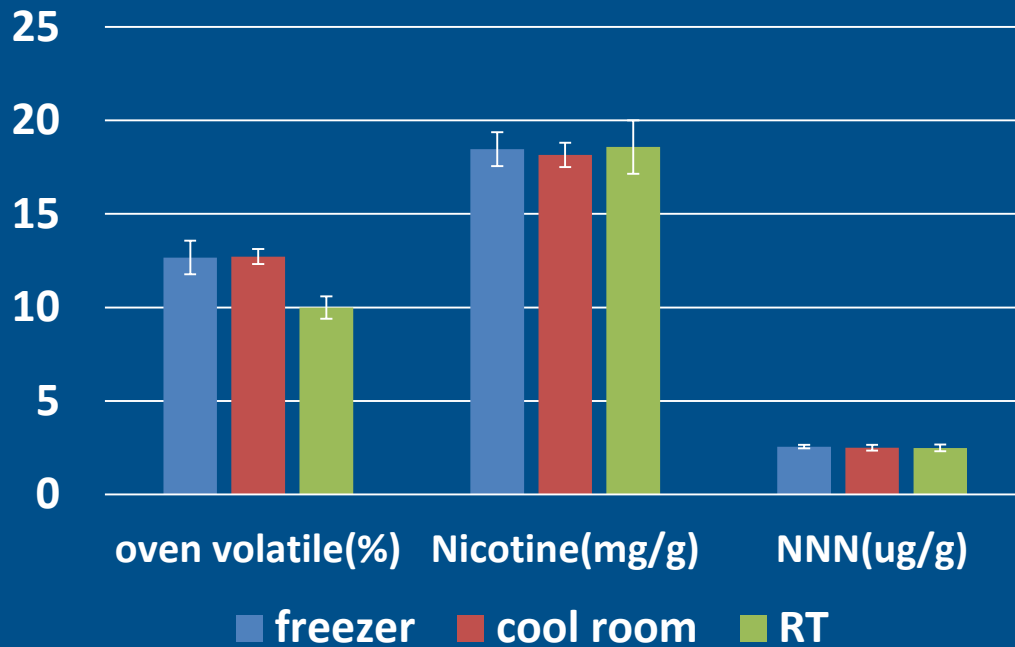
➤ Cigarettes stored at room temperature



		CO/cig	TPM	Nicotine	NNN
	Puffs/cig	mg/cig	mg/cig	ug/cig	ng/cig
average	8.6	10.6	9.8	745	114
CV%	3.3	5.3	4.5	5.6	6.8

Tobacco Filler data

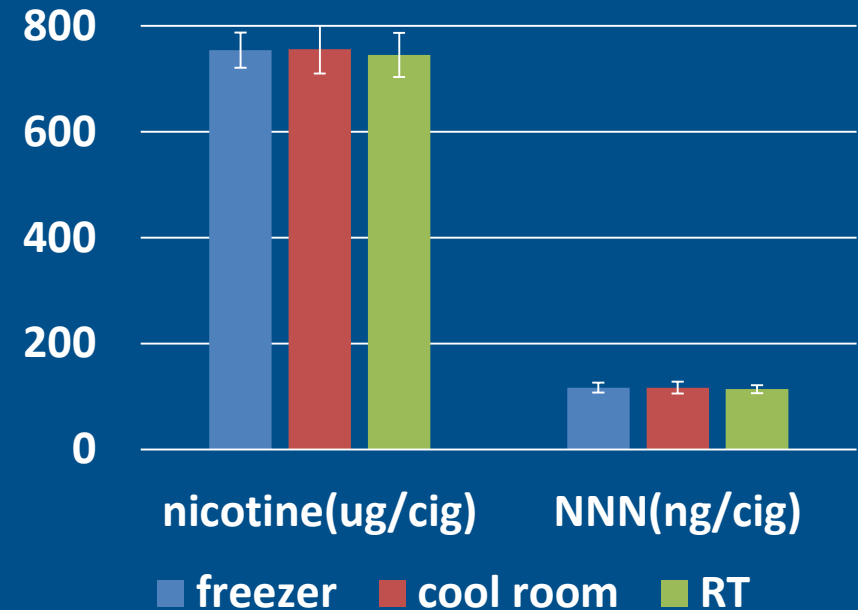
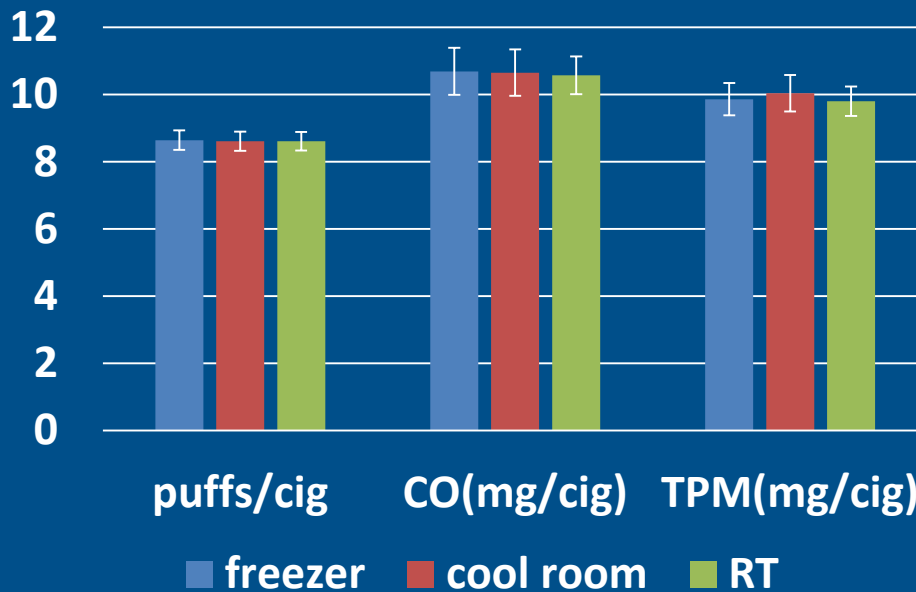
➤ Compare three storage conditions



	Nicotine	NNN
	mg/g	ug/g
average	18.40	2.52
CV%	1.2	1.8

Smoke data

➤ Compare three storage conditions



	Puffs/cig	CO/cig mg/cig	TPM mg/cig	Nicotine ug/cig	NNN ng/cig
average	8.6	10.6	9.9	752	116
CV%	0.2	0.6	1.3	0.8	1.5

Conclusions

- **3R4F relative stable after storage in freezer or cool room for 1 year**
- **The oven volatile of 3R4F decreased ~ 20% after storage in lab ambient temperature for 1 year**
- **Smoking data of 3R4F (storage in lab ambient temperature for 1 year and lost ~20% oven volatile) is consistent with other storage conditions after cigarettes were conditioned before analysis.**

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