

SYNTHESIZING A VACCINE FOR THE TREATMENT OF ADDICTION TO THE FENTANYL OPIOID

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OPIOID CRISIS

Prescription
usage

2015:
exponential rise
in fentanyl

Recreationally
mixed with
other drugs

Toxicity

Naloxone

Vaccine would
provide long-
term protection



Fentanyl vials



Vials of various opioids

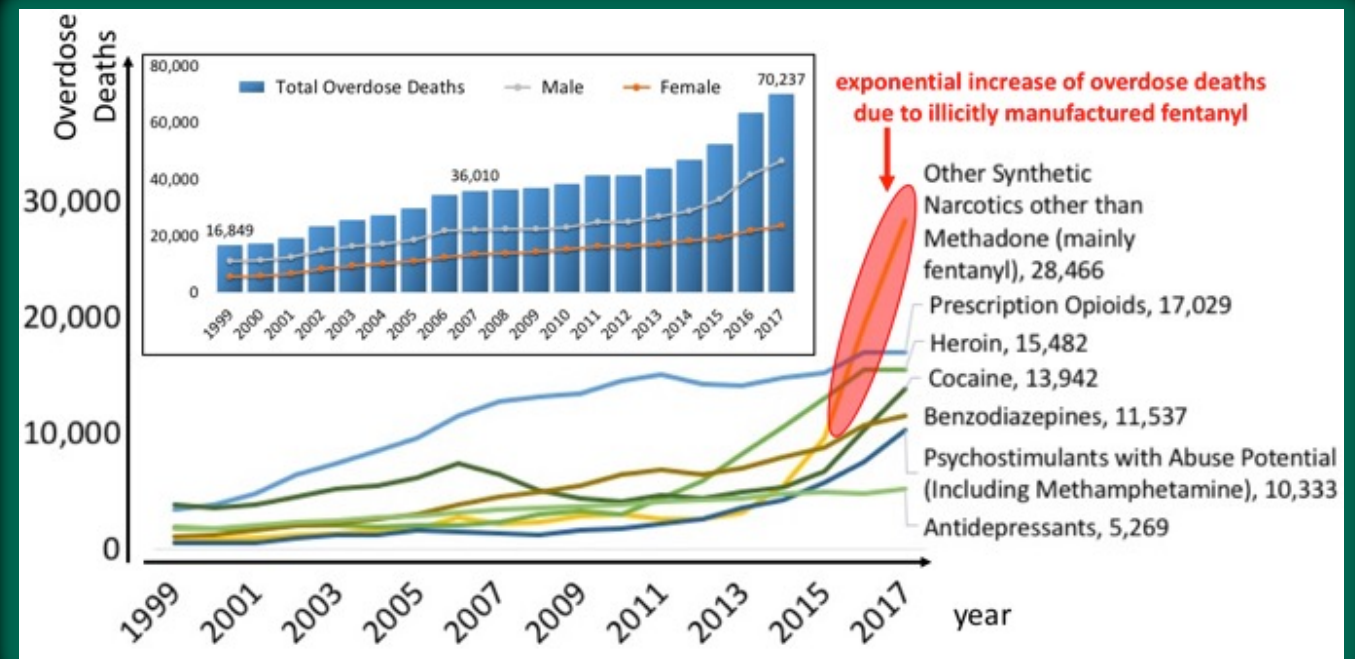
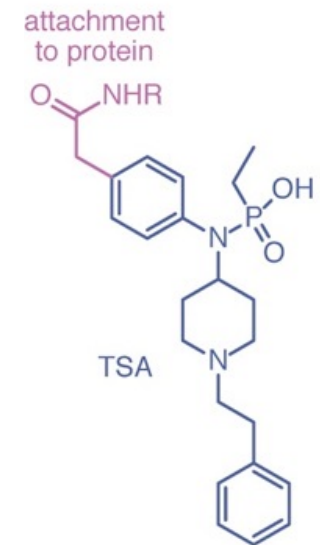
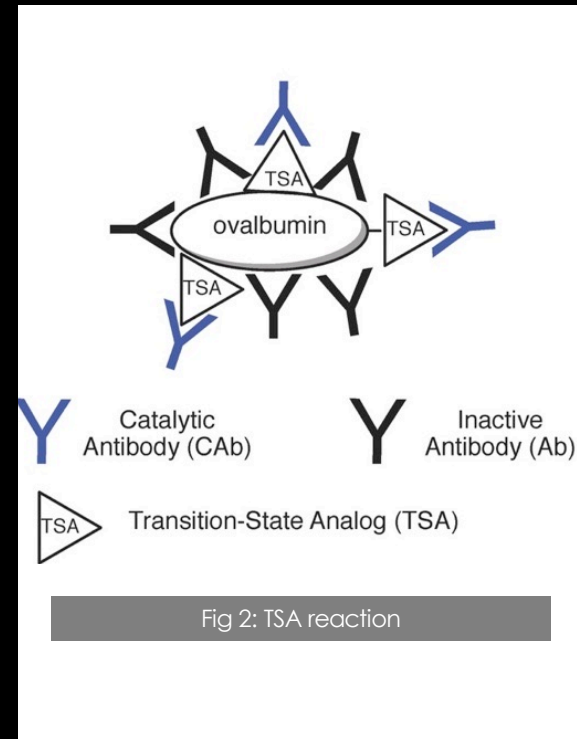


Fig 1: Depicts exponential increase in fentanyl consumption

SIGNIFICANCE OF TSAs

- ❖ TSAs are powerful because they resemble a substrate's transition state
- ❖ Enzymes bind with strong affinity to the transition state of a substrate



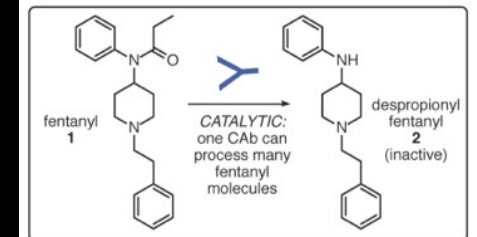
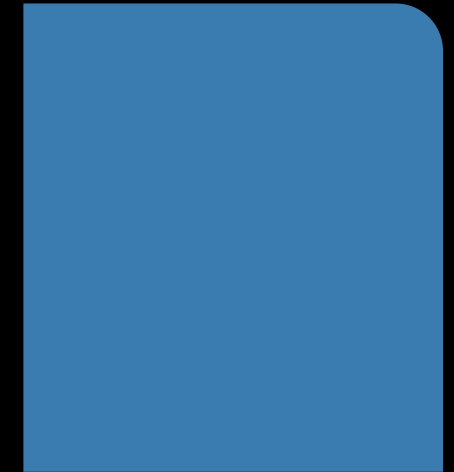
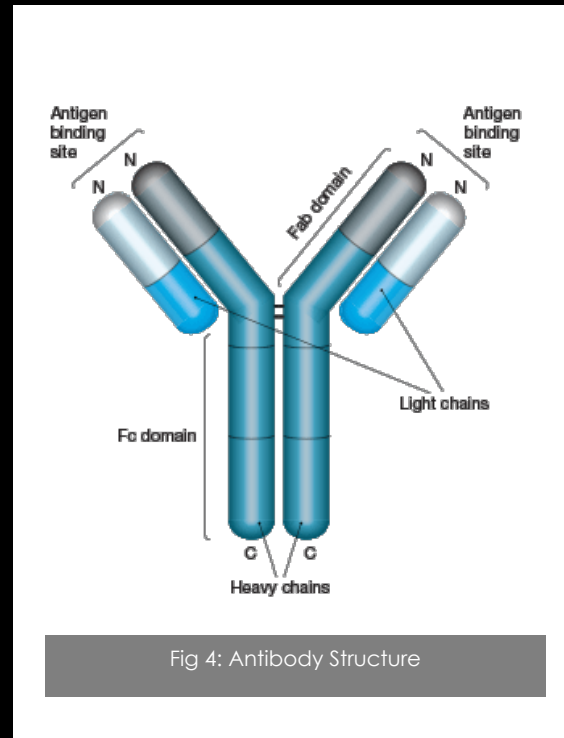
CATALYTIC ANTIBODIES (ABZYMES)

Immunity

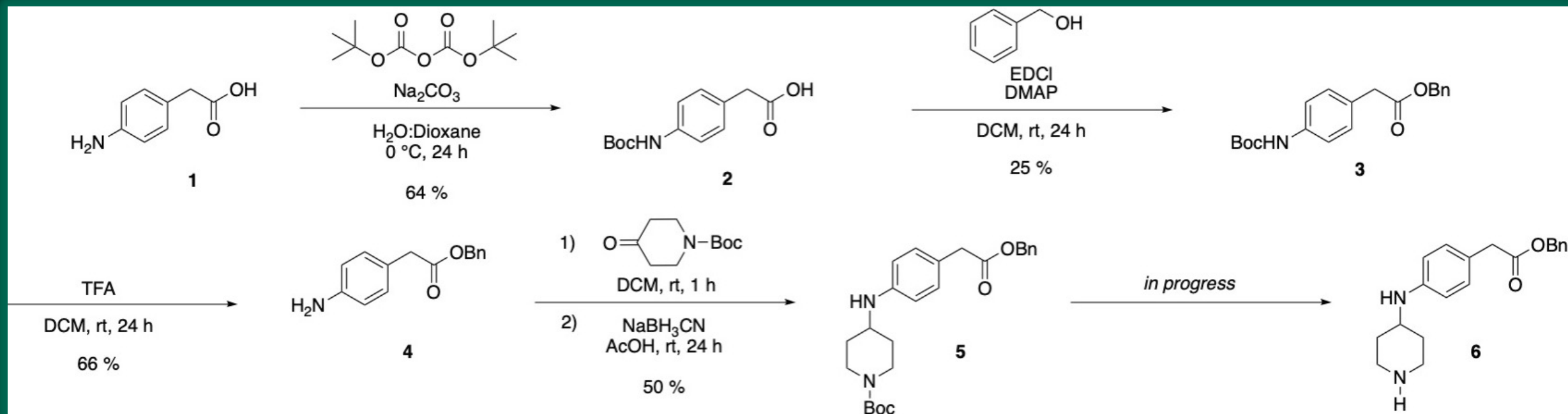
- ❖ Antibodies are made of 2 heavy and 2 light chains
- ❖ They target antigens for destruction

Abzymes

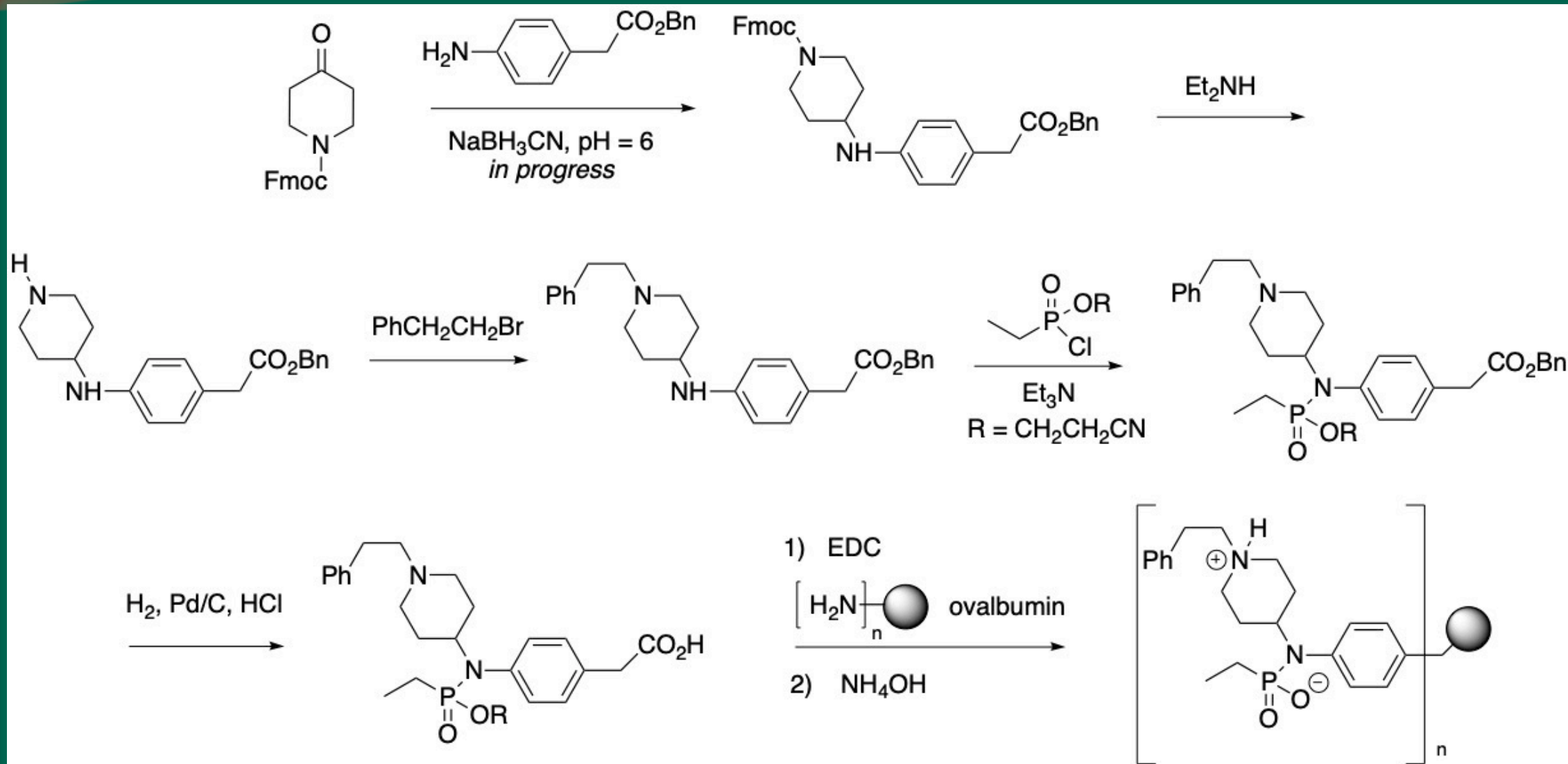
- ❖ Antibodies with specific catalytic activity using TSAs as the antigen
- ❖ Abzymes specific to fentanyl



SYNTHESIS OF VACCINE AGAINST FENTANYL



FUTURE STEPS



CONCLUSION



9 steps total



5 steps successfully
accomplished



HNMR spectra results of current molecule

FUTURE OBJECTIVES

- ❖ Collaborations with NIH's HEAL initiative
- ❖ Synthesis of TSAs relevant to fentanyl derivatives
- ❖ Explore vaccines against other drugs, snake venom, and chemical warfare agents





42	7	43	1	95	15	
Mo	N	Tc	H	Am	P	
15	1	76	15	67	44	16
P	H	Os	P	Ho	Ru	S
	75	34	18	6	1	
	Re	Se	Ar	C	H	

ACKNOWLEDGMENTS

Karen R. Winters and Dr. Montchamp

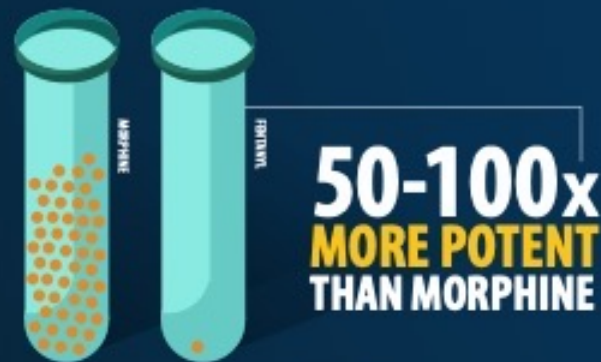
We gratefully acknowledge financial support from TCU Science and Engineering Research Center (SERC) and TCU RCAF

QUESTIONS?

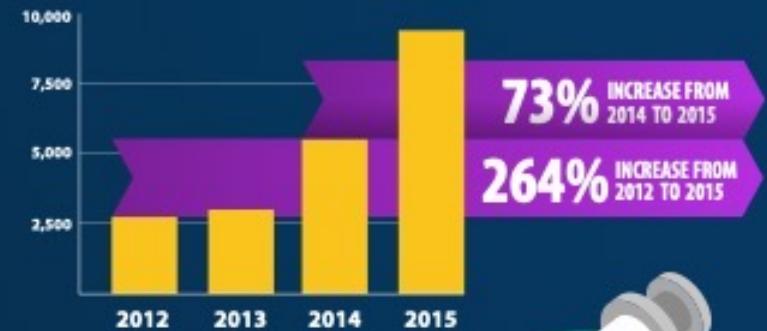
FENTANYL: Overdoses On The Rise



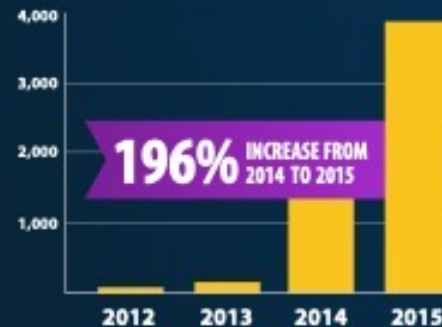
Fentanyl is a synthetic opioid approved for treating severe pain, such as advanced cancer pain. Illicitly manufactured fentanyl is the main driver of recent increases in synthetic opioid deaths.



SYNTHETIC OPIOID DEATHS ACROSS THE U.S.



Ohio Drug Submissions Testing Positive for Illicitly Manufactured Fentanyl



ILLICITLY MANUFACTURED FENTANYL

Although prescription rates have fallen, overdoses associated with fentanyl have risen dramatically, contributing to a sharp spike in synthetic opioid deaths.

