HIBERNATION AND THROMBO-PROTECTION: EXPLORING FIBRINOLYTIC MECHANISMS IN THE AMERICAN BLACK BEAR

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Research Question

What fibrinolytic regulatory mechanisms differ in naturally hibernating American black bears (*Ursus americanus)* vs. active summertime bears?
Specifically, how do tissue plasminogen, urokinase plasminogen activator, and plasminogen activator inhibitor-1 differ?

Background

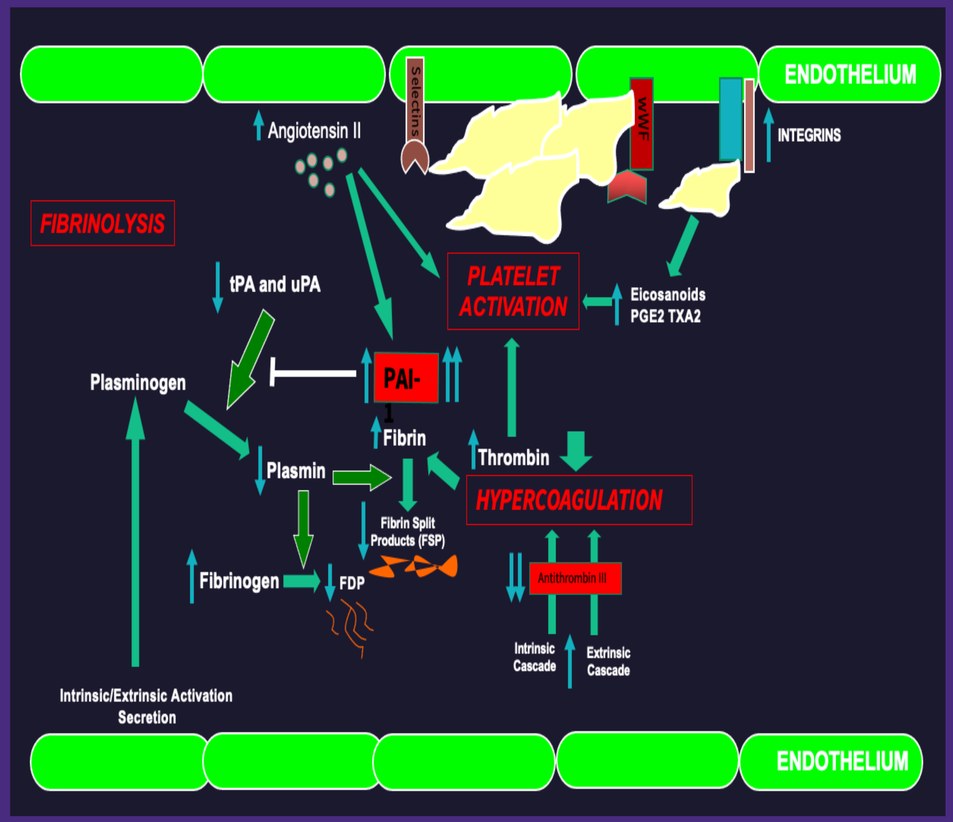
- Coagulative normalcy is balance between two competing forces: **Coagulation and Fibrinolysis**
- Virchow's Triad states that any incidence of 3 factors will contribute to a thrombotic event –1. Stasis 2. Hypercoagulable State 3. Vessel Wall Injury
- **Thrombotic events** contribute to **1 in 4 deaths worldwide** many are a result of stasis and post hospital stay
- **American black bears hibernate** and enter a state of immobility for **3 to 6 months** a year without encountering any thrombotic pathologies
- Previous studies noted **platelet sequestration** and down regulation of factors within the coagulation cascade
- BUT, **no one** has studied the impact of **fibrinolytic processes** on coagulation within the American black bear

Methods

- After partnership with the government entity Michigan Department of Natural Resources, we tracked **16 bears** in northern Michigan (12 hibernating + 4 Active)
- GPS collars were utilized to **geolocate hibernation dens** and track movement patterns
- After IACUC and following strict protocols, the bears were sedated, and blood draws were completed via **jugular or femoral veins** of **live bears**
- Samples were immediately centrifuged and frozen to -80 Fahrenheit prior to shipment to Fort Worth, TX
- Human pathology laboratory at Baylor All Saints in Fort Worth, TX completed analysis of tPAI, uPA, fibrinogen, plasminogen, antiplasmin and PAI-1 (antigen and activity)

WHY DOES IT MATTER?

- Cross-translational studies are an opportunity to dig deeper into the science behind many ailments of human-kind. If we widen our scope to explore what nature has to provide, we may be able to discover more about ourselves.
- **American Black Bears** are similar in body size to humans and provide an opportunity to discover or explore a devastating ailment that plagues humans
- Collaborations across state, government, and private entities takes time. With enough persistence and patience, **DREAMER** projects can become a **REALITY**



DateBear ID	Age	SexBlood - Light Blue	Blood - Purple	Comments		
1/24/23	BB0201	Adult	F	Y	Y	N/a
1/24/23	BB0202	Juvenile	M	Y	Y	1 year old.
1/24/23	BB0203	Juvenile	F	Y	Y	1 year old.
1/24/23	BB0204	Juvenile	M	Y	Y	1 year old.
2/27/23	BB6902	Adult	F	Y	Y	N/a
2/27/23	BB6903	Juvenile	M	Y	Y	1 year old.
2/28/23	BB6808	Adult	F	Y	Y	N/a
2/28/23	BB6809	Juvenile	M	Y	Y	1 year old.
2/28/23	BB6810	Juvenile	F	Y	Y	1 year old.
3/1/23	BB8303	Adult	F	Y	Y	N/a
3/2/23	BB6804	Adult	F	Unknown	Y	Light bluetop not recorded on datasheet, will have to check freezer.
3/10/23	BB4201	Adult	F	Y	Y	N/a
6/1/23	BB5203	Adult	F	Y	Y	N/a
6/2/23	BB5204	Adult	M	Y	Y	N/a
6/14/23	BB1701	Adult	M	Y	Y	Freezing of samples was delayed due to being on island, may be compromised.
6/24/23	BB5205	Adult	M	Y	Y	N/a

Results & Future Directions

- Our samples are currently being analyzed, but we suspect we will see an increase in tPA, uPA, plasminogen, antiplasmin, and a decrease in fibrinogen, PAI-1 activity
- Collaborations with the Michigan Department of Natural Resources will continue with further evaluation and increase in subject count in future years

Acknowledgements

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- Thank you to Dr. Bartlett at Baylor All Saints for being willing to process our bear samples