That is why

Why can wood frogs freeze solid and survive?

Ice fills the spaces between the cells, while sugar keeps the inside of each cell liquid.

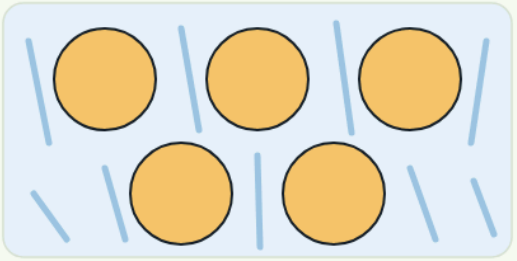
A Ice comes in from outside

1. **Skin freezes first**
   a little at a time
2. **Ice moves in**
   through veins and arteries
3. **Brain freezes**
   eyes glaze over and turn white
4. **Heart stops**
   no heartbeat, no breathing

Up to 60% of the body freezes solid.

The danger: growing ice pulls water out of the cells.

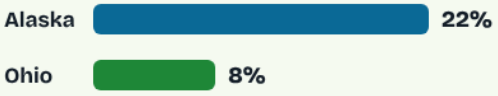
B The sugar trick



Ice between the cells, sugar inside them

Stored glycogen becomes glucose, and the liver pumps it into every cell. The sugar helps hold water inside.

Liver size, as a share of body mass



Alaskan frogs also had about 10 times more urea, a second protector.

C Practice freezes in the fall

Freeze at night, thaw by day



About 10 to 15 mini-freezes before winter. Each one adds more sugar.

13× more glucose in the muscles of frogs frozen outdoors than in frogs frozen steadily in the lab

How long can they last?

- **Alaska, outdoors**
  218 days at −18°C
- **Eastern U.S. and Canada**
  a few weeks, no colder than about −7.2°C

Spring: thawed lab frogs were back on their feet within two days. Wild frogs lay eggs in meltwater pools.

Syrup jars in a block of ice: the ice fills the gaps, the sweet inside stays liquid.

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