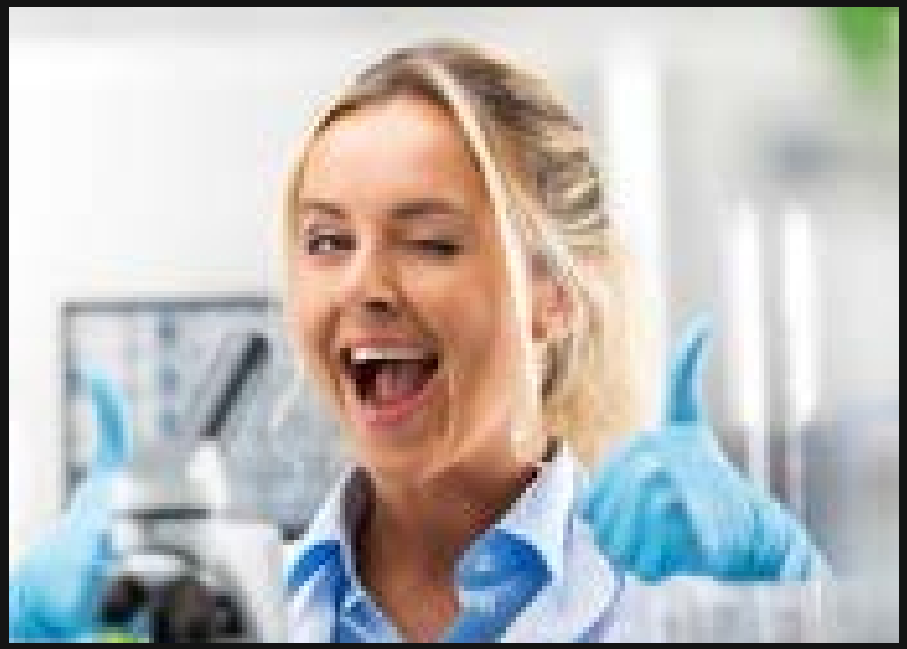
Enrichment for Animal and Researcher Well-Being

Enrichment Benefits in Research

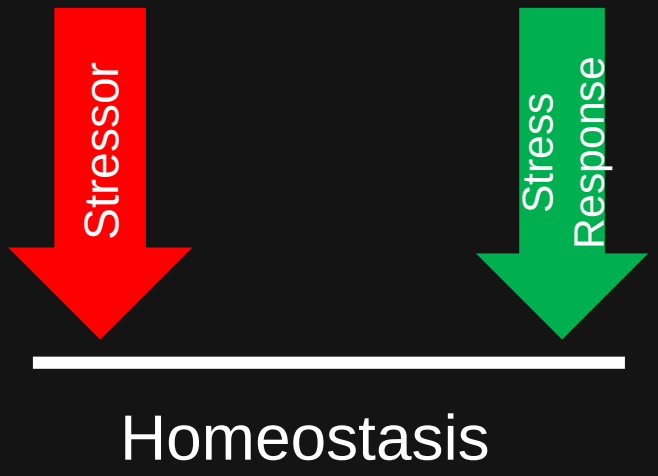
- Regulatory agencies require enrichment
  - This is a minimum standard
- Sometimes viewed as inconvenient, frivolous, or actively harmful
- Well chosen/designed enrichment should be none of these
- It can improve researcher welfare, too!



What is “enrichment”?

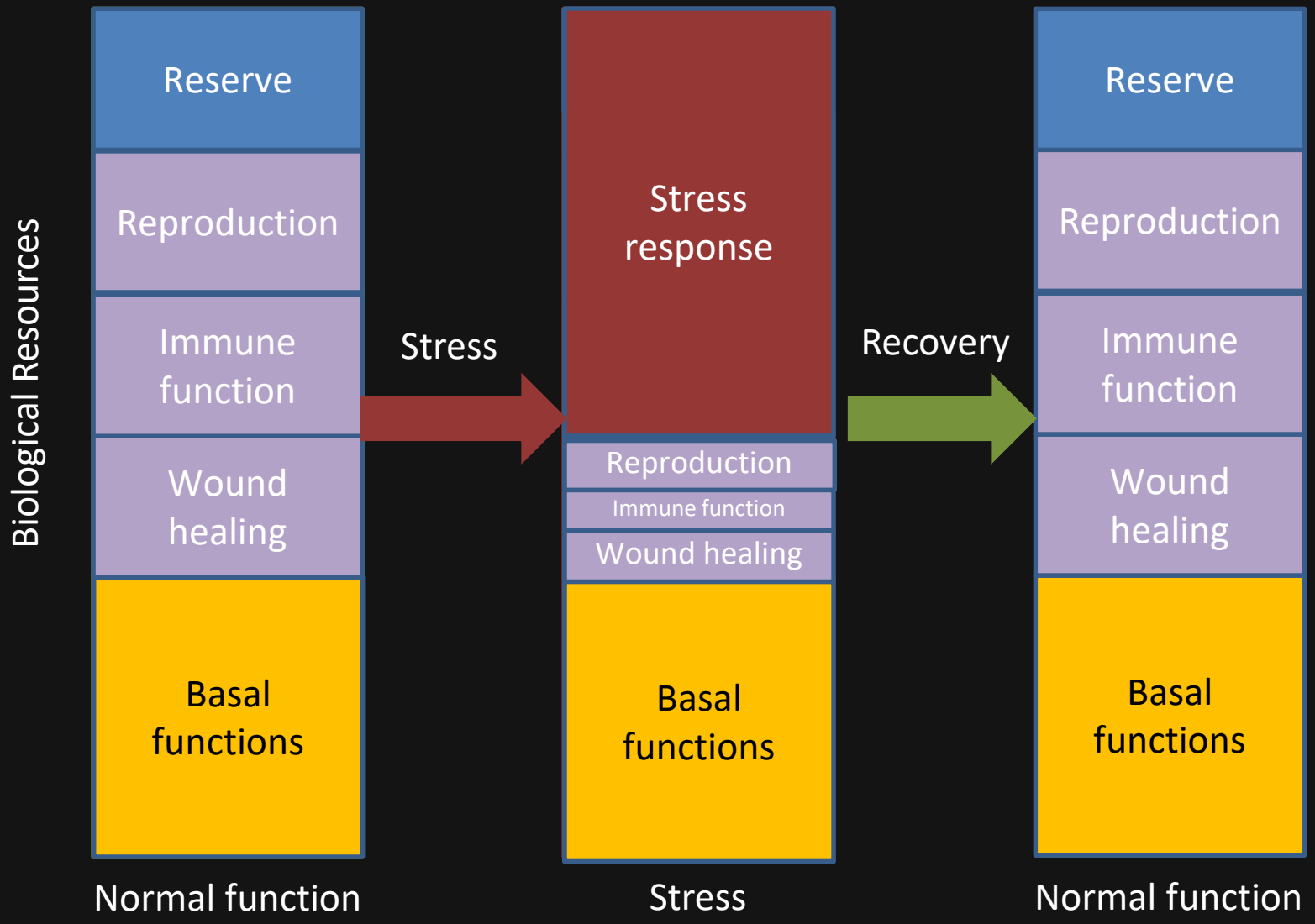
- Inconsistent terminology use in scientific literature
- In **neurology/psychology** it means “a combination of complex inanimate and social stimulation”[1]
  - Often focuses on novelty for its own sake, rather than biological relevance for the animal
  - Can include aversive stimuli (marbles, overcrowding) and potentially decrease welfare
  - Is an **experimental variable,** typically assessed for neurologic effects
- In **animal behavior and welfare**, it refers specifically to measures that improve well-being[2]
  - These improvements occur through helping animals cope with stress by provision of biologically relevant enrichments
  - Not an experimental variable

What is “stress”?



- **Homeostasis** – body’s internal equilibrium
- **Stressor** – perceived threat to homeostasis[3]
- **Stress response** – body’s effort to protect/restore equilibrium
- This stress response requires biological resources

How does stress affect research results?



Adapted from Moberg[3]

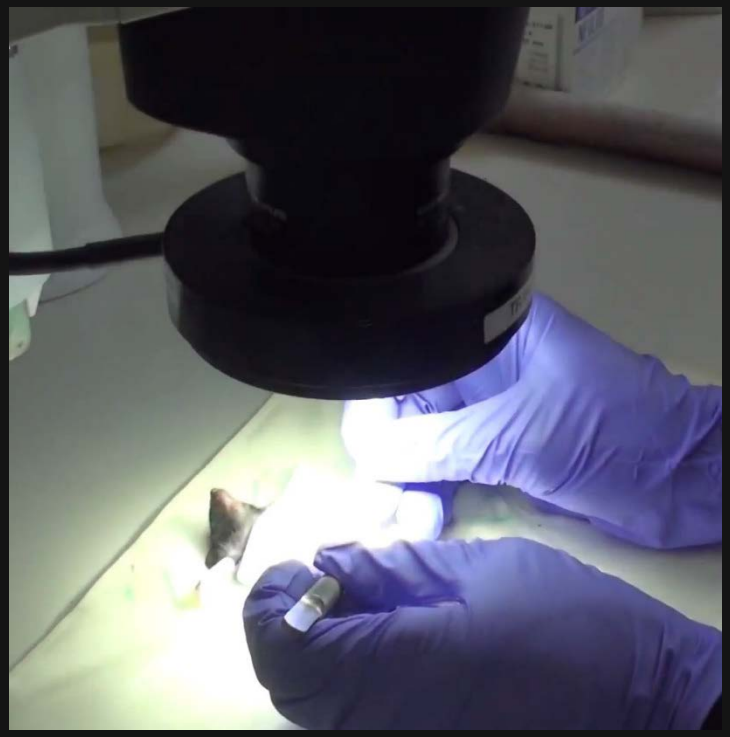
How enrichment helps

- Increases *resiliency* (ability to cope with stressors)
  - Increased reserve (negating stressor's impact)
  - Decreased resources needed for stress response (decreasing the stressor's impact)
  - Shortened recovery time (shortening the duration of the stressor's impact)

How does enrichment improve research?

- Decreases impact of stressors (known and unknown) on research findings
- Improves external validity/replicability
- Likely improves translation to humans

Decreases impact of stressors on research findings

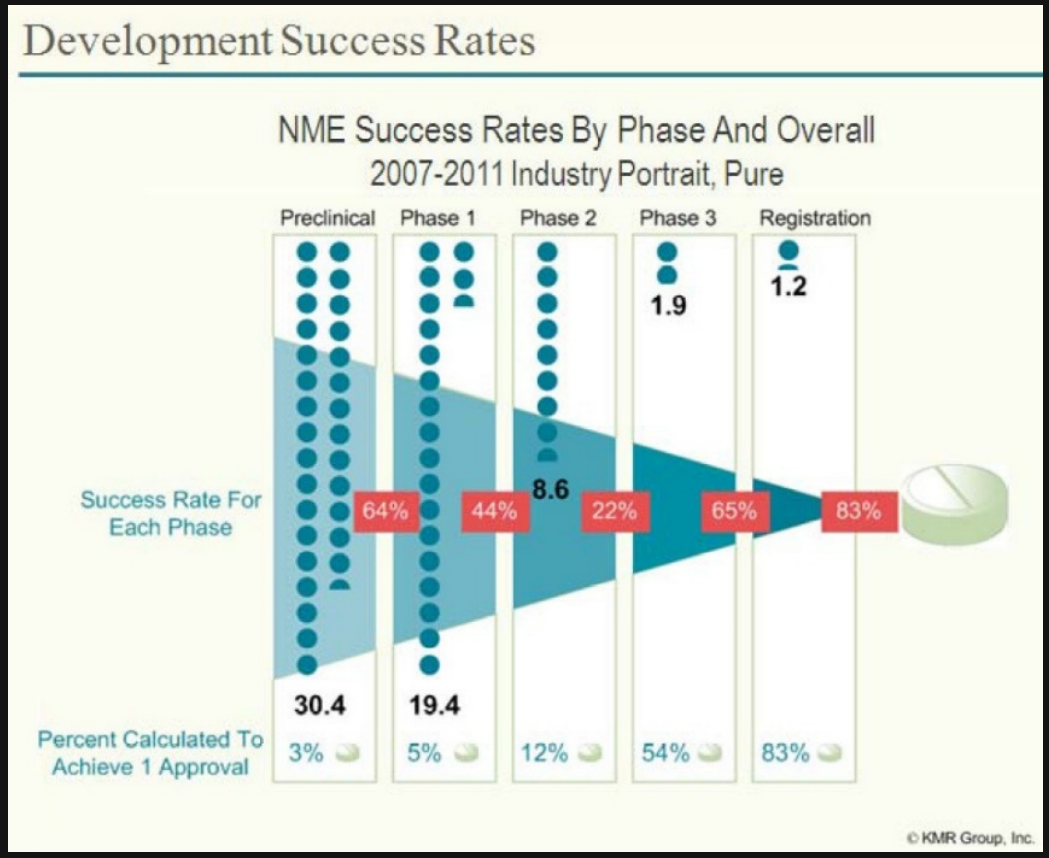


- Research involves lots of known stressors - anesthesia, surgery, immune challenges, restraint, sample collection
- Laboratory life also comes with “hidden” stressors
  - Cold rooms[4,5], irregular light cycles[6,7], aversive handling methods[8,9,10], non-preferred bedding types[11,12,13], and vibration and ultrasonic noise[14,15,16] are often present but unaccounted for in experimental design
  - Stressors of greatest concern are prolonged, successive, and/or severe
- Provision of enrichment allows animals to cope in a fashion that they choose, according to individual needs -- even if researchers are unaware of that stressor’s existence or effect
- Bonus effect of moderating individual variation!

Improves external validity

- Stressors vary between institutions, facilities, labs, individual housing rooms
- Allowing animals to cope with those stressors and maintain homeostasis minimizes those variations
- Improves likelihood that results will be generalizable to other locations, populations

Likely improves translation to humans



- Low rates of success transitioning from animal to human studies
- Overstandardization?
- Hidden stressors?
- Enrichment can help with both!

So what do we do?

- Provide beneficial enrichment
  - Biological relevance
  - Animal's perceived experience
  - Study needs
- Re-evaluate regularly
  - Stressors may change over time, so may appropriate enrichments
  - Ongoing research may uncover new effective enrichments

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Questions?