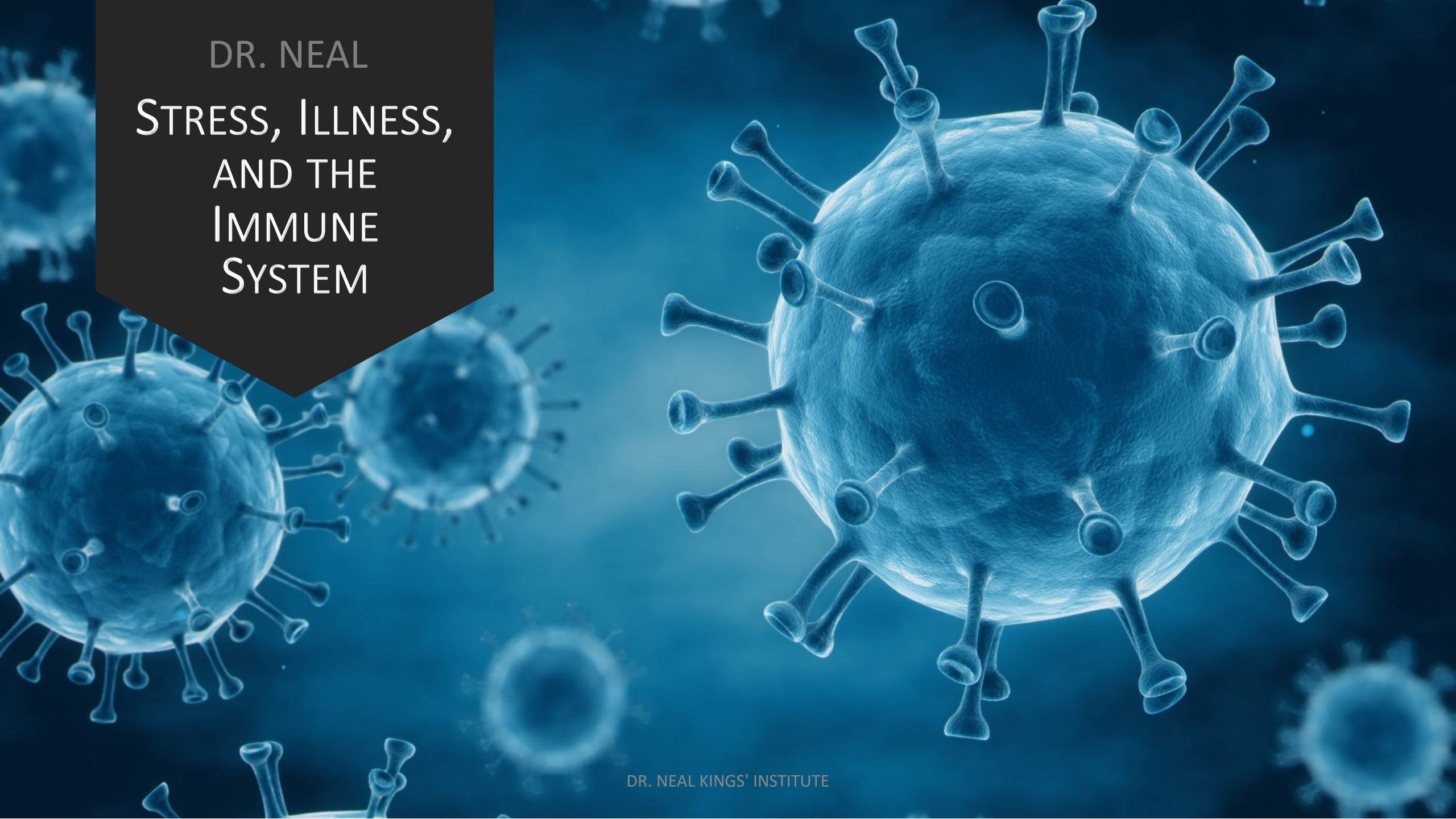
DR. NEAL

Stress, Illness, and the Immune System



Discussion Topics

1. Illness
2. Research Strategies for Examining Stress and Illness
3. The Life Events Model of Stress and Illness
4. Daily Hassles Model
5. Linking Stress, Illness, and the Immune System
6. Strengthening the Protective and Immune Systems

ILLNESS

Illness

- Disease can be caused by a virus, genetic factors, or environmental conditions
- Illness/sickness is the unhealthy state caused by the disease
- The immune system is the body’s defense against infections
- **Sick role:** people look for support and empathy from others when they are feeling ill
  - Rewards from being ill are secondary gains

RESEARCH STRATEGIES FOR EXAMINING STRESS AND ILLNESS

Research Strategies for Examining Stress and Illness

- **Retrospective research design:** simplest design; ask people to recall past illnesses and stressors
  - Verify the following:
  - Is report accurate? Do secondary gains motivate the report? What's the direction of the correlation?
- **Prospective research design:** a longitudinal design; examine a person's stressors and illnesses for a set period of time
  - Quality of data higher with prospective designs
    - Less likely to be effected by memory distortions and biases

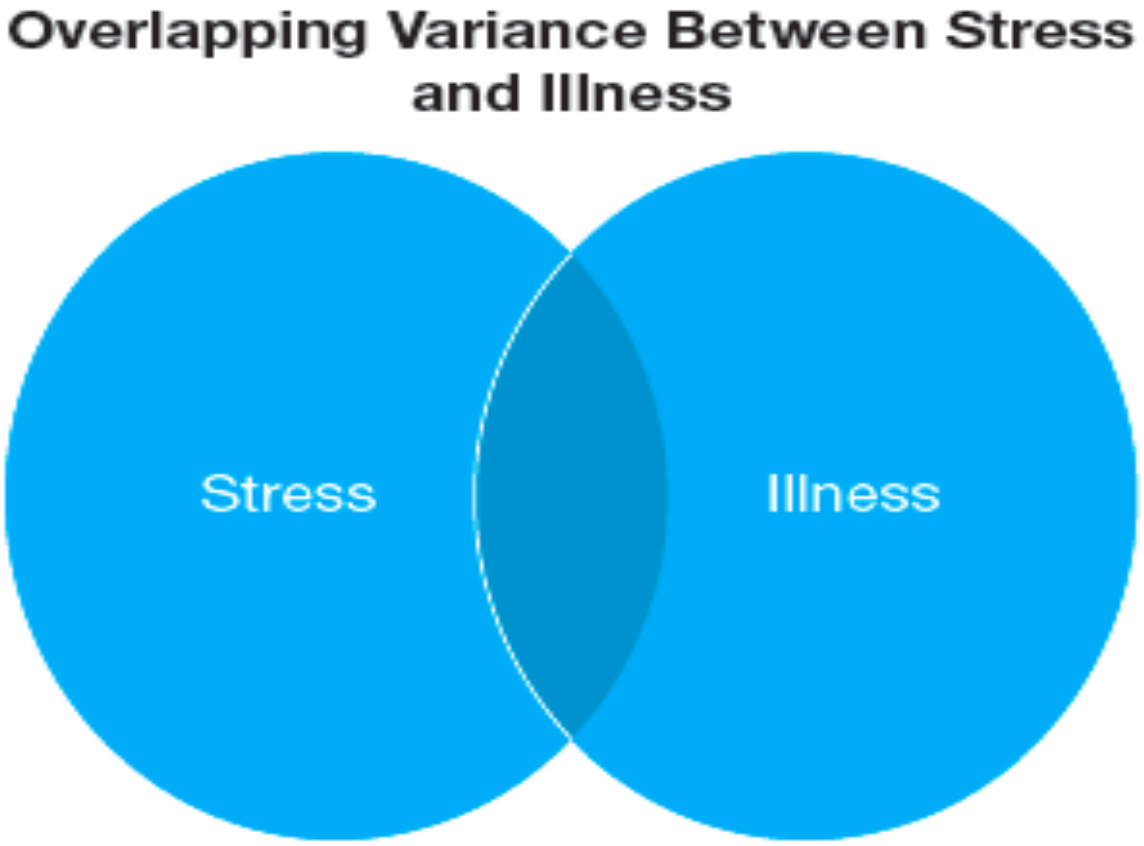
Research Strategies for Examining Stress and Illness (cont'd.)

- **Correlational studies:** describe the magnitude of covariation between stress and illness
  - But do not show causation; an observational study
  - Pearson's Product Moment correlations (Pearson's *r*) are the most common

Interpreting Correlation Coefficients.

An *r* = .30 for stress and illness means that 9% of the variance overlaps between stress and illness.

In other words, **9% of the variance of illness can be accounted for by stress** and vice versa.



Research Strategies for Examining Stress and Illness (cont'd.)

- **Experimental studies:** hold extraneous variables constant while manipulating independent variables
  - Measurable outcomes are dependent variables
  - An experimental group receives the manipulation and is compared to the control group
- A good experimental study can show causation

Research Strategies for Examining Stress and Illness (cont'd.)

Methodological quality of different types of studies

Weaker	Stronger
Retrospective—Lower internal validity	Prospective—Higher internal validity
Correlational—Lower internal validity	Experimental—Higher internal validity
Single Study—Lower external validity	Meta-analytic—Higher external validity

- Studies should be reliable and valid

THE LIFE EVENTS MODEL OF STRESS AND ILLNESS

The Life Events Model of Stress and Illness

- **SRSS** uses life change units (LCU) to categorize different events on the scale
  - Criticisms of the SRSS led to dozens of other similar scales being developed

The Life Events Model of Stress and Illness

- Problems with the **SLE** (stressful life events) model:

1. Most studies based on retrospective self-reports
2. Some items on checklists overlap with illnesses
3. Effects of negative affectivity/neuroticism levels may influence responses

The Life Events Model of Stress and Illness (cont’d.)

- Methodological problems have made it difficult to establish firm and consistent relationships between life changes and illness
  - More objective measures such as blood tests are used in collaboration
- Concept of negative life stress events seems to be valid with regard to illness

The Life Events Model of Stress and Illness (cont'd.)

- **Bedford College Life Events and Difficulties Schedule (LEDS):** generally used with clinical populations (i.e., clinical depression)
  - Uses a semi-structured interview and a panel of **trained raters** rather than a checklist
  - Examines the potential long-term threat of an event in the context in which it occurs
  - Disadvantages:
    - Requires training in administering and scoring
    - A panel must analyze and arrive at a consensus
    - Expensive and time consuming

DAILY HASSLES MODEL

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Daily Hassles Model

- Research by Lazarus and colleagues showed that **hassles played more of a role in illness than life change events**
- This model suffers from similar methodological problems as life events model
- Example: neuroticism can influence self-report of hassles
- SLE and hassles measures are sometimes combined to study reports of health problems

LINKING STRESS, ILLNESS, AND THE IMMUNE SYSTEM

LINKING STRESS, ILLNESS, AND THE IMMUNE SYSTEM

Linking Stress, Illness, and the Immune System

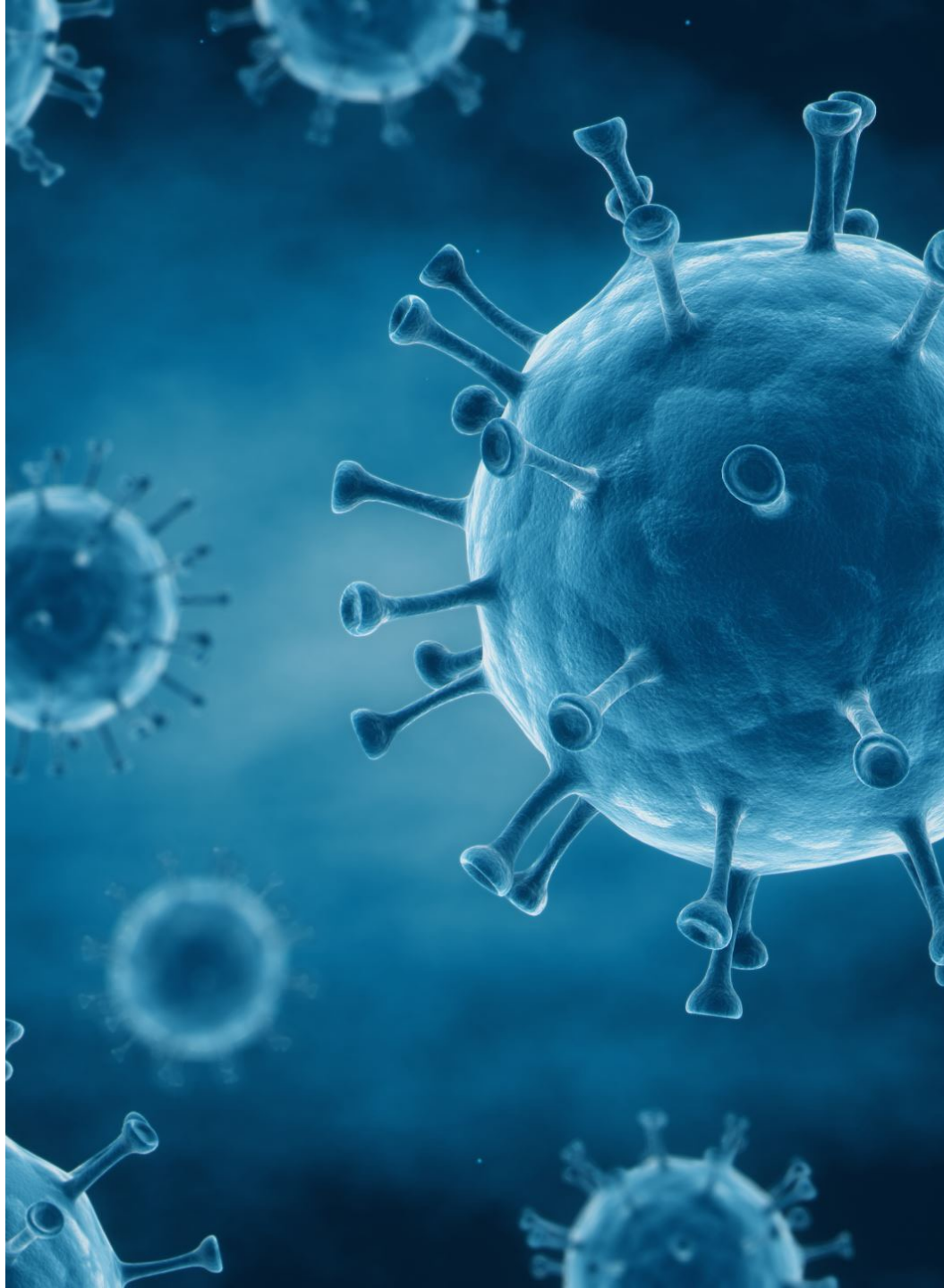
- **Psychoneuroimmunology (PNI):** the study of the relationship between

- Psychological
- Neurological
- Immunological interactions

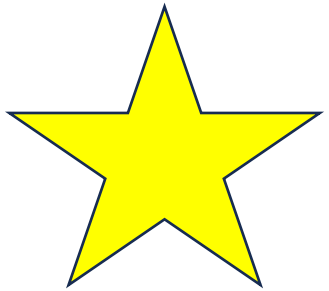
- **PNI** now an established field backed up by hundreds of studies

The Human Immune System

- The immune system protects us from harmful antigens such as bacteria, fungi, and viruses
- Several layers of defense comprise the immune system:
  - Skin and mucous membranes: bacteria that enter the skin are attacked by **leukocytes**
  - Known as innate protective system
  - Adaptive immune system takes 4-5 days to defend against a novel intruder
  - Once an intruder is recognized, it responds quickly



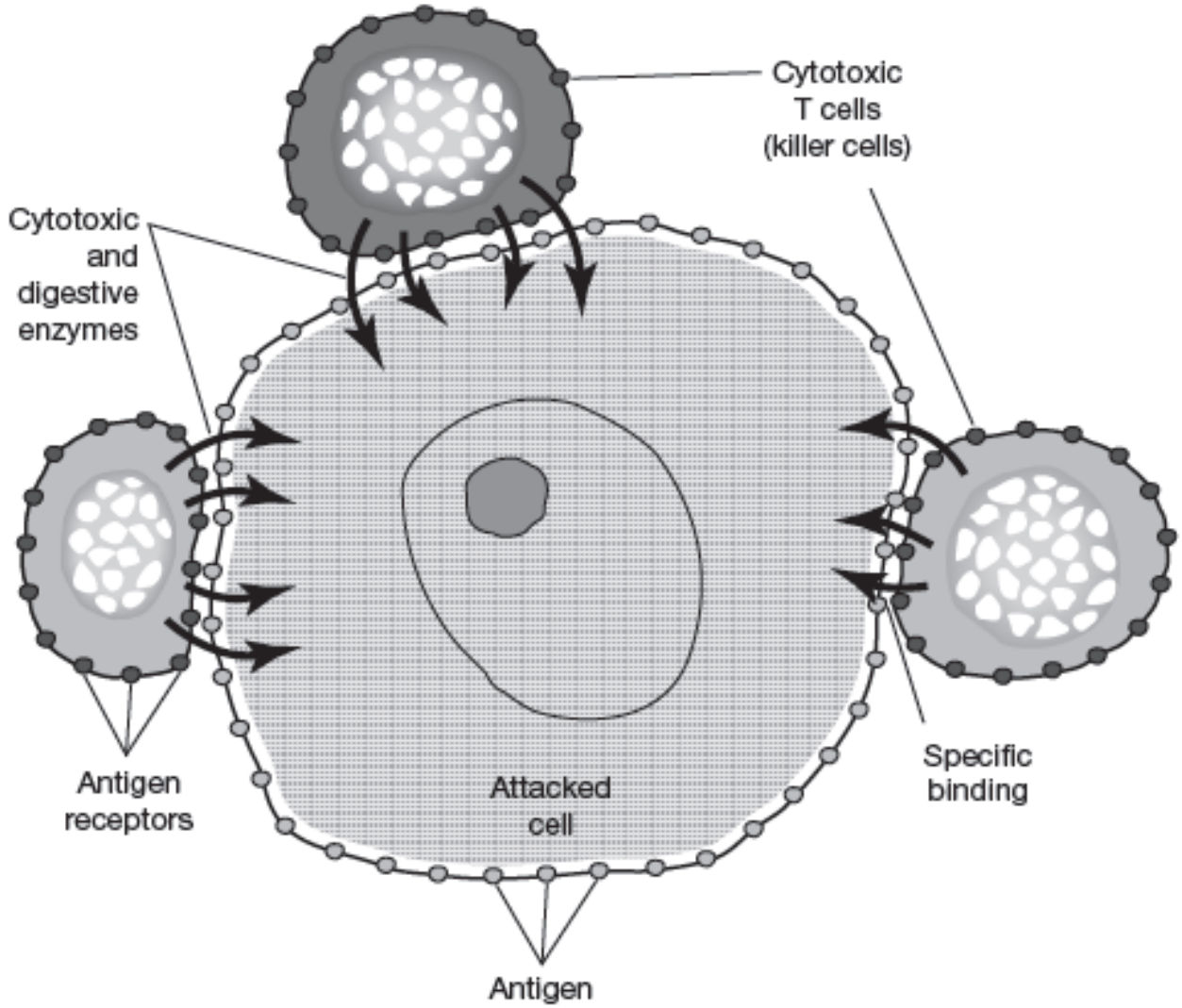
The Human Immune System (cont'd.)



- **Inflammation** is characterized by heat, redness, and swelling in response to damaged tissue or infection
- **Granular cells** are first line of defense, they eat the antigens they attack
  - **Natural killer (NK) cells** recognize foreign cells such as tumors and release **cytotoxic chemicals** to kill them
  - The thymus develops **T-cells** to produce immunity

The Human Immune System (cont’d.)

- **B cells** produce antibodies known as **immunoglobins** that circulate through the body and do not allow antigens to invade the body’s own cells
- **Humoral immunity** involves releasing antibodies; precise yet time consuming



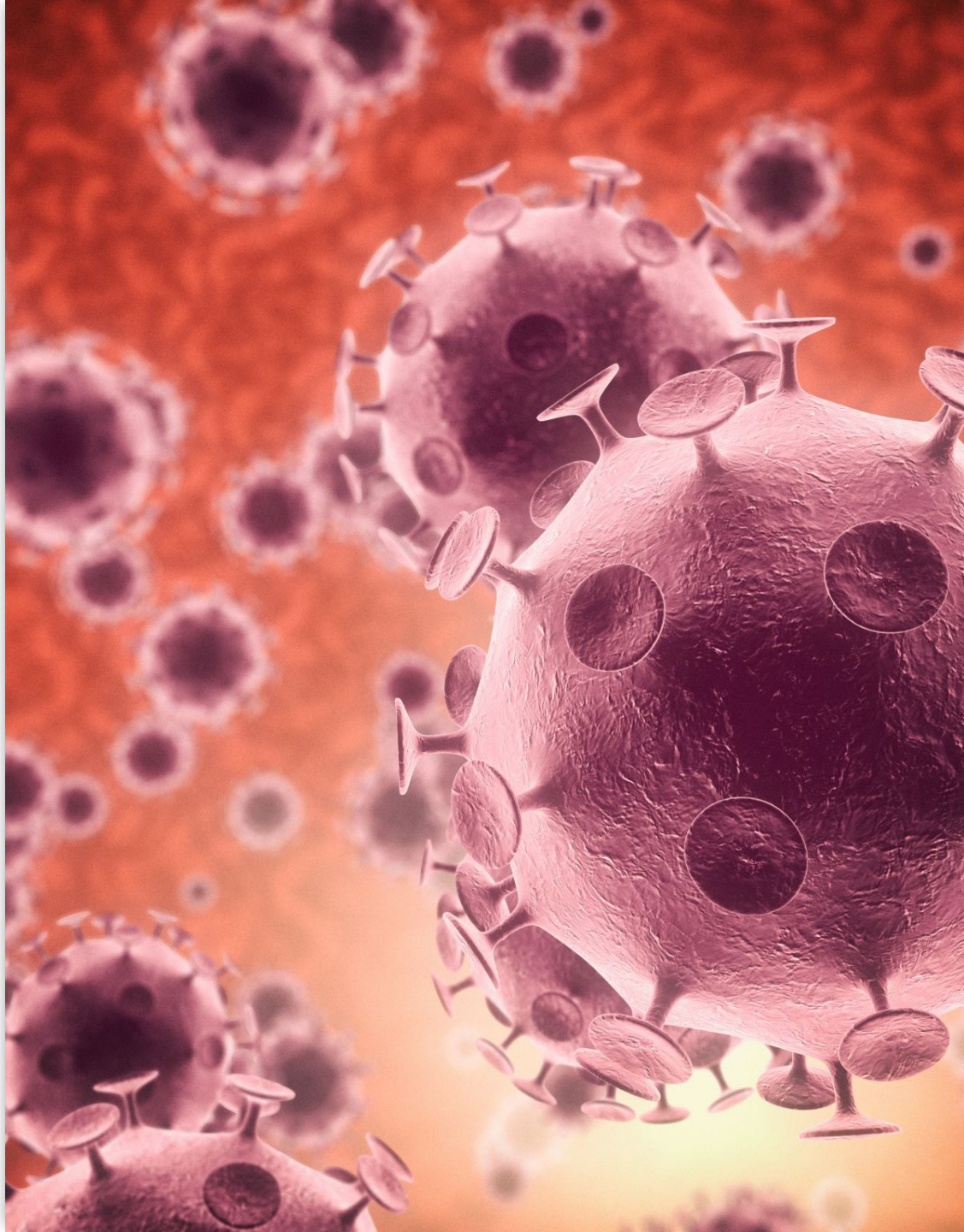
Action of Cytotoxic T Cells on a Targeted Cell. Like the James Bond-style NK cells of the innate immune system, these adaptive immune system 008s are “licensed to kill.” SOURCE: Guyton & Hall (2006), *Medical Physiology*, 11th ed.

The Immune System and Acute Stressors

- **Neuropeptides released during exercise** enhance the immune system's response
- As stressors become chronic (longer lasting), the body switches from the **cellular-mediated** immune system to the **Humoral immune** system
- Both can be suppressed over a long amount of time

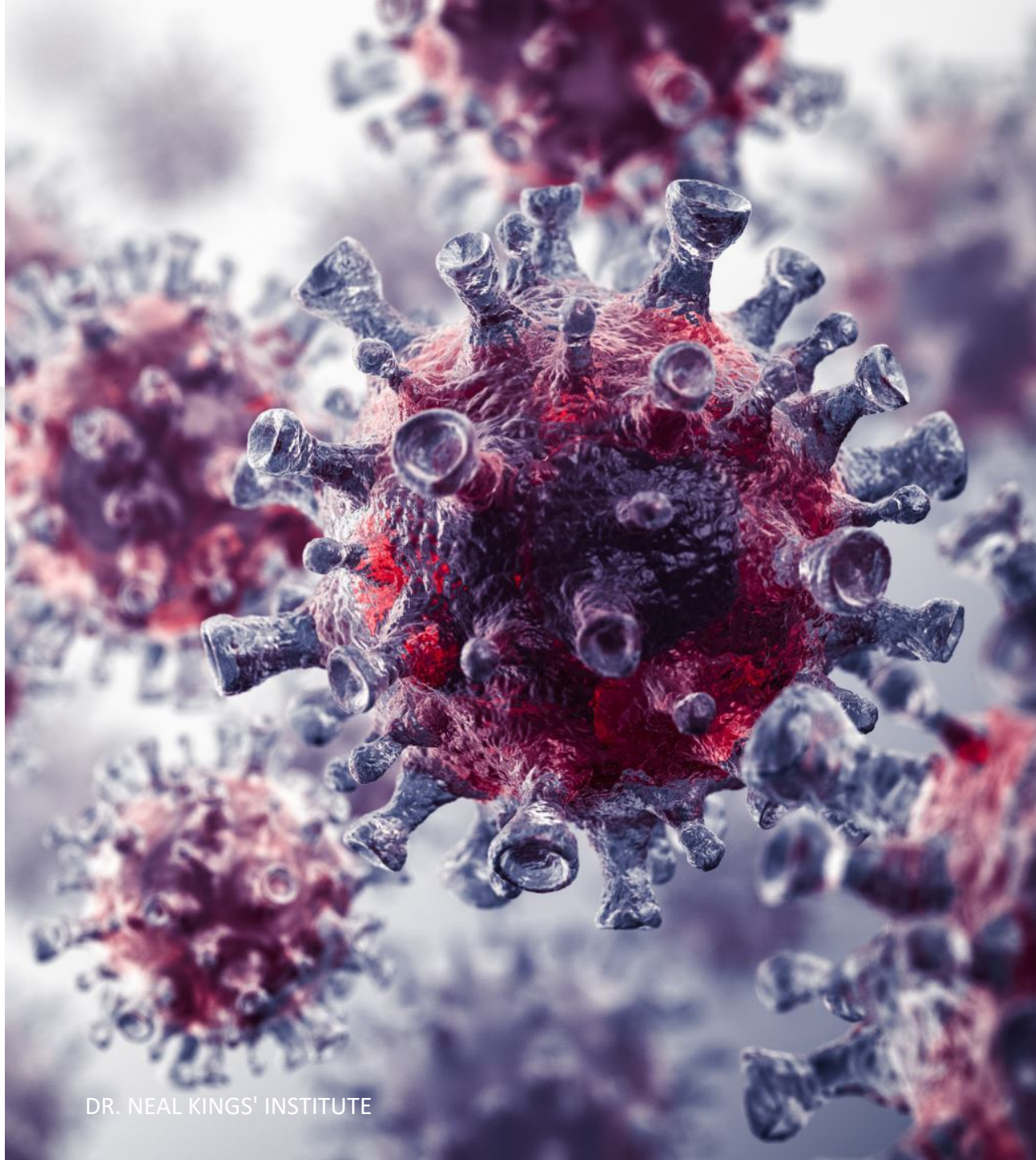
The Immune System and Chronic Stressors

- **Immune dysregulation:** overreacting immune system can result in allergies, arthritis, etc., while an underreacting immune system can cause cancer and cold/flu outbreaks
  - Both types of reactions can occur simultaneously
  - During chronic stress, **glutocorticoids** and **cortisol** are elevated



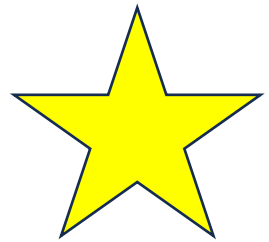
Stress and Immunosuppression

- Many studies have been done to examine the effects of stressors on **suppression of the immune system**
- Categories of stress-related immunosuppressive studies:
  - Exam stressors
  - Large-scale disasters
  - Chronic stress of long-term caregiving
  - Loss and bereavement
  - Viral challenges



STRENGTHENING THE PROTECTIVE AND IMMUNE SYSTEMS

Strengthening the Protective & Immune Systems



- Behavioral strategies for strengthening the immune system:

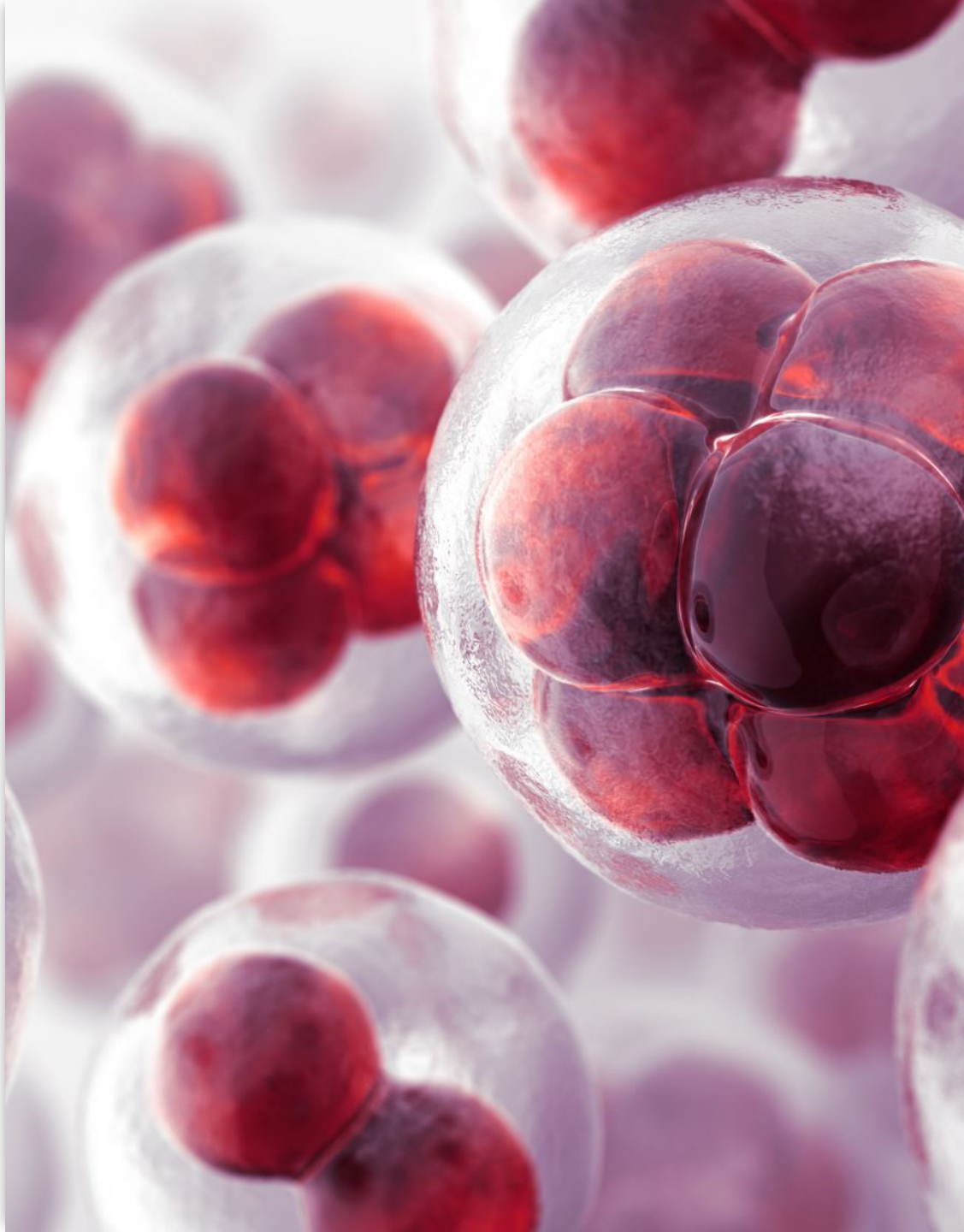
1. Wash hands: remove harmful pathogens before they get into your body
2. Get sufficient sleep: good quality sleep maintains the immune system
3. Exercise: regular moderate exercise is the most effective behavioral strategy for boosting the immune system
4. Diet – foods as medicine

Strengthening the Protective and Immune System (cont’d.)

5. Eat healthy: certain nutrients retain and repair immune cells, such as antioxidants, omega-3 fatty acids, and zinc
6. Seek treatment for clinical depression: depression is linked with immune suppression
7. Avoid known immune system suppressors: example: cigarette smoking and excessive alcohol

Summary

- System of organs, tissues, and cells designed to protect the body against infections is referred to as the immune system
- PNI is the study of the relationship between the psychological, neurological, and immunological interactions
- Prospective research designs are preferred over retrospective designs
- Meta-analytic studies find average effect sizes from many studies



Summary (cont’d.)

- Human immune system is divided into innate and adaptive immune systems
- Cellular mediated immunity and humoral immunity ratio should be balanced
- Acute stressors can mobilize immune response, but chronic stressors broadly suppress it
- Several recommendations exist for strengthening the immune system