Psychoneuroimmunology: Brief review and implications for cancer

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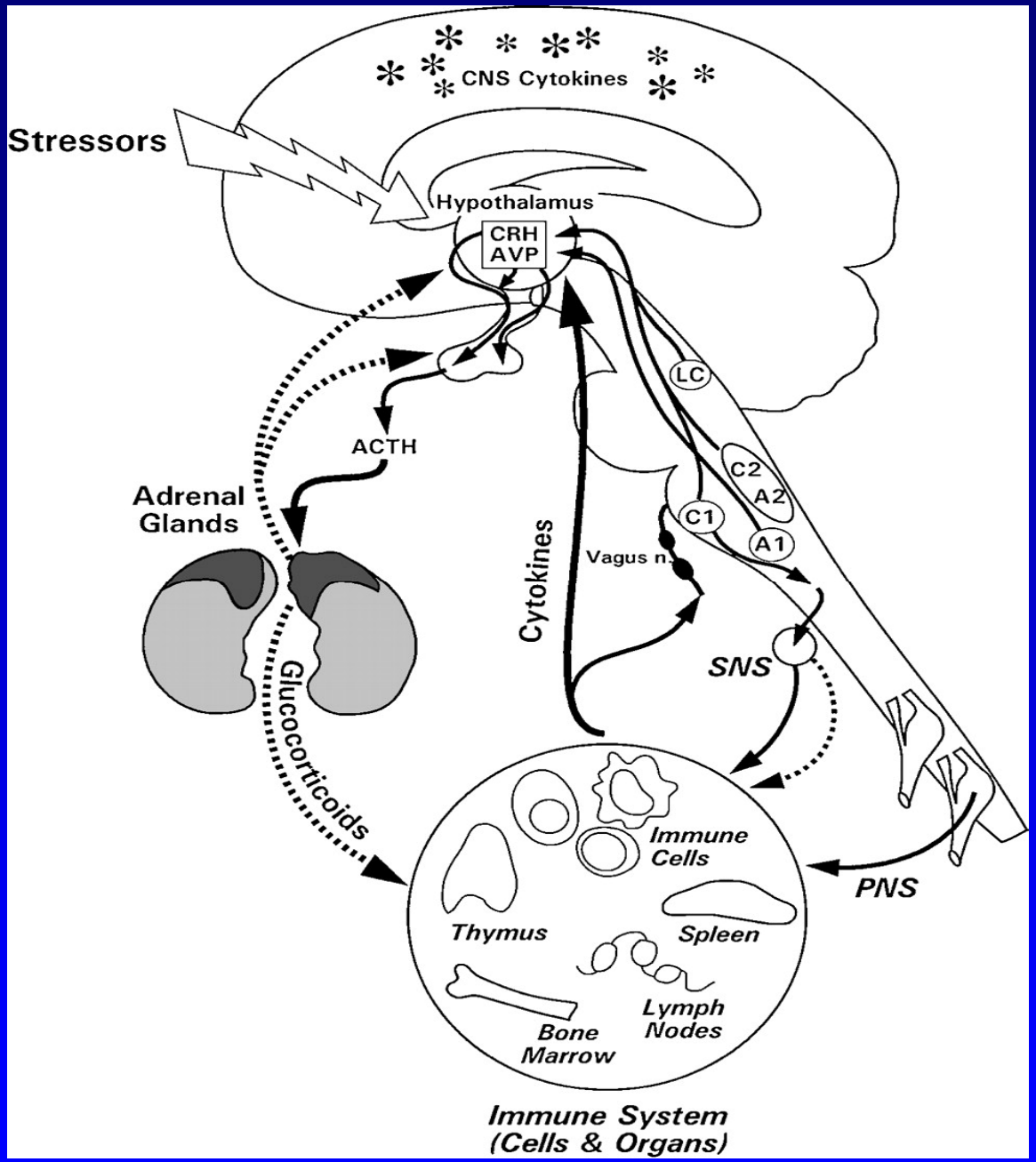
Psychoneuroimmunology (PNI)

- Study of interactions among central nervous system, neuroendocrine system, and immune system
- Research on brain-immune interactions began in 1920s
- In 1970s and 80s, “hard” evidence of functional and anatomical brain-immune connections documented
- In 1980s, research on stress and IS in humans

Brain-immune connections



Stress and the immune system I

- **Acute/experimental stressors:** parachute jumping, public speaking, marital conflict
  - Associated with *increase* in certain immune measures, part of "fight-flight" response

Stress and the immune system II

- **Chronic/naturalistic stressors**: Exams, bereavement, separation/divorce, unemployment, caregiving
  - Associated with *decrease* in certain immune parameters

Modulators of immune response

- Perceptions of stressor
- Psychological responses to stressor
  - Emotional states/moods
  - Cognitive appraisals/beliefs
- Personality
- Social factors

Interventions and immunity

- **Relaxation interventions**: mixed results
- **Emotional disclosure**: mixed results
- **Stress management interventions**: mixed results
  - Strongest effects seen among stressed groups (e.g., HIV-positive individuals)

Relevance for cancer I

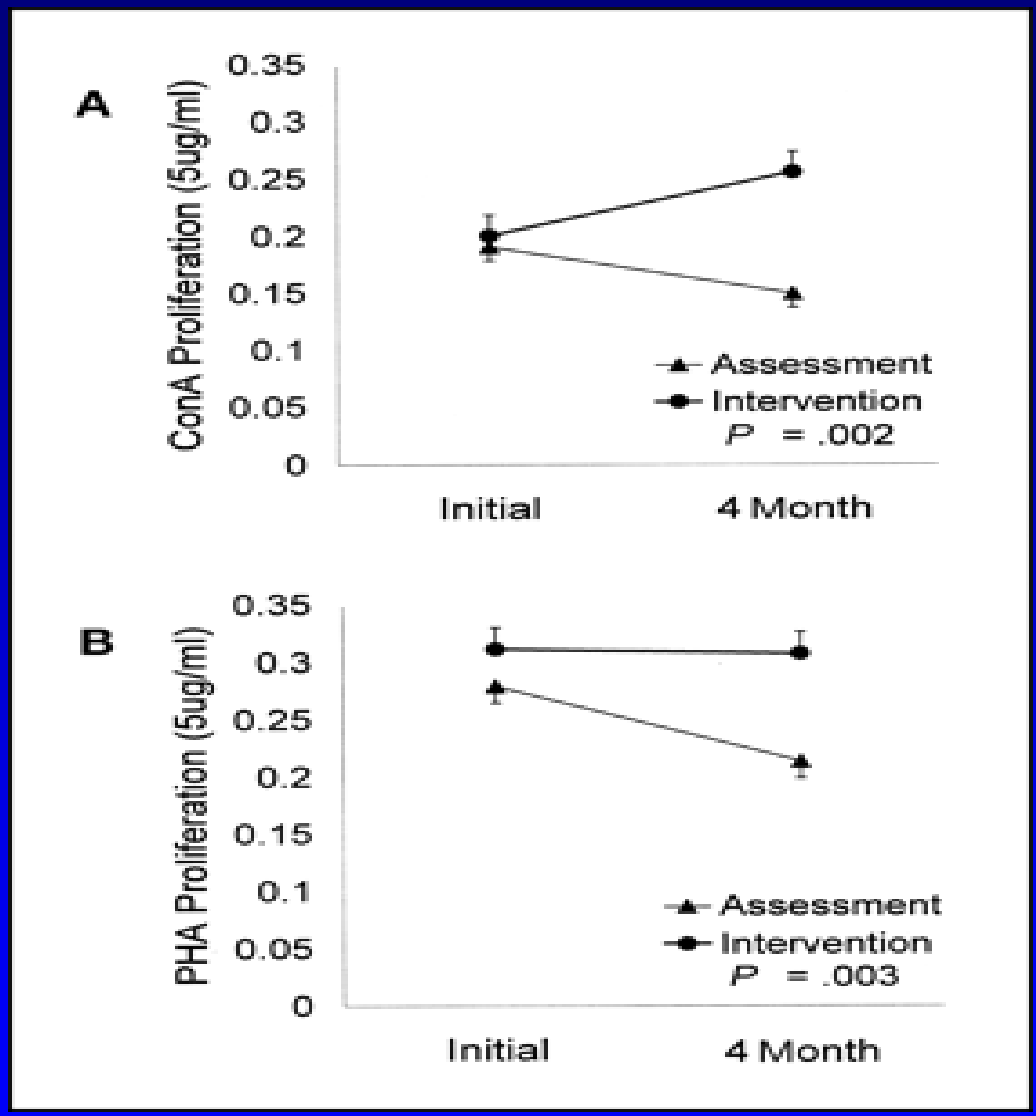
- Stress may have similar effects on immune function in cancer patients
  - Higher levels of cancer-related stress associated with lower NK cell activity and T cell responses among women with Stage II/III breast cancer before chemotherapy (Andersen et al., 1998)

Relevance for cancer II

- Social support has beneficial effects on immune function in cancer patients and spouses
  - Emotional support from spouse/significant other and doctor associated with greater NK cell activity in breast cancer pts (Levy et al., 1990)
  - Social support associated with greater NK cell activity and T cell responses among spouses of cancer patients (Baron et al., 1990)

Relevance for cancer III

- Intervention effects on immune function among cancer patients
  - Psychosocial group interventions buffer immune decline among breast cancer patients undergoing chemotherapy (Andersen et al., 2004; McGregor et al., 2004)



Andersen et al., 2004

Relevance for cancer IV

- Intervention effects on immune system and survival
  - Psychoeducational group intervention for individuals with newly diagnosed malignant melanoma (Fawzy et al., 1990, 1993, 2003)
    - Improvements in mood and active coping at 6 months post-intervention
    - Improvements in NK cell function at 6 months
    - ↑ survival at 6 years and 10 years

Important caveats

- Health relevance of stress-related immune changes in healthy populations **and cancer patients** has not been determined
- Role of immune system in breast cancer is unclear

Novel biological mechanisms

- Inflammation and angiogenesis
  - Both play important role in tumor growth and spread
  - Both influenced by stress hormones
  - Psychosocial factors may modulate inflammatory and angiogenic cytokines in cancer patients
    - Low social support associated with elevations in IL-6 and VEGF in ovarian cancer patients

Novel psychological predictors

- Inhibited temperament
  - Associated with exaggerated autonomic reactivity to stress, predicts poor outcomes in HIV/AIDS
- Positive psychological states
  - Associated with positive outcomes in immune-related medical conditions (colds, HIV/AIDS)

Immune effects on cancer symptoms

- Immune to brain communication in cancer
  - Activation of immune system by cancer/cancer treatment may influence behavioral symptoms, including fatigue, sleep, mood, and cognitive function