Read the following article and answer the 4 questions at the end. These will count as quiz “take-home” questions and will be added to your quiz score.

**Stress-Induced Modulation of the Immune Response to Recombinant Hepatitis B Vaccine (1991)**

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*Note: the whole article is posted on our web site in Chapter 14 Stress.*

**Abstract**

Each of a series of three hepatitis B (Hep B) inoculations was given to 48 second-year medical students on the 3rd day of a 3-day examination series to study the effect of academic stress on the ability to generate an immune response to a primary antigen. Those students who seroconverted after the first injection (25%) were significantly less stressed and anxious than those who did not seroconvert at that time. In addition, students who reported greater social support demonstrated a stronger immune response to the vaccine at the time of the third inoculation, as measured by antibody titers to Hep B surface antigen (HBsAg) and the blastogenic response to a HBsAg peptide (SAg).

**Methods:** (what follows is a short excerpt that tells us how they measured the psychological stuff.)

Several psychological measures provided data on stress, anxiety, and social support. The Profile of Mood States (POMS) (15) is one of the best self-report measures for identifying and assessing transient, fluctuating mood states. The measure is widely used, has excellent normative data, and psychometrically is very strong in terms of both reliability and validity (15). We were particularly interested in the tension-anxiety scale, the most responsive scale in our medical student population to the short-term increases in distress associated with examinations. The POMS was administered immediately prior to each vaccine inoculation.

The Perceived Stress Scale (PSS) (16) is a 14-item scale that assesses global perceptions of stress and measures the degree to which individuals appraise situations in their life as unpredictable, uncontrollable, and overloading. Normative data are available from a national probability sample (17). The PSS was administered at the second and third inoculation points.

The Interpersonal Support Evaluation List (ISEL) is a 40-item scale measuring perceived availability of four kinds of social support: appraisal, belonging, tangible, and self-esteem. Higher scores indicate greater reported support (15). The ISEL was administered in April, a month before the third and final vaccination. The test-retest reliability for a 4-week interval for the student version of the ISEL is 0.87. Although the ISEL was administered a month before the booster inoculation because of timing issues in the larger longitudinal study, we have confidence that the scores are stable (16).

**DISCUSSION**

In this study, we found that both stress and social support were related to medical students' ability to generate an antibody response to the HBsAg recombinant vaccine. Students who were more anxious
and more stressed showed a delay in seroconversion. Following seroconversion, those who reported less social support had a poorer immune response to the HBsAg, as determined by both the combined measure for antibody titers and the T-cell response to Hep B SAg. These data represent an important extension of past research on stress and immunity.

The answers to the following questions can be short. Typing is not necessary. You can handwrite the answers on a blank sheet of paper if you wish. Make sure your name is on the top of everything.

1. The abstract said that 25% of the subjects “seroconverted” after the first injection. What does it mean that one has “seroconverted”? i.e. how are they different from those who hadn’t yet seroconverted? (I found a good definition of seroconversion on wikipedia)
2. If you were injected with a disease antigen, would you want to seroconvert early or late?
3. The study found that 2 variables weakened the immune response in medical students. What were those 2 variables?
4. Find a copy of the PSS and attach it to your answers.