

1、科學界已證實空氣中的 PM 2.5 會造成人體健康危害。

- (1) 試解釋 PM 2.5 (4 分)。
- (2) PM 2.5 的濃度及化學組成會受到什麼因子影響 (6 分)?
- (3) PM 2.5 可能會造成什麼健康危害 (6 分)?
- (4) 為何 PM 2.5 是值得關心的環境衛生議題 (6 分)?
- (5) 如何降低或控制 PM 2.5 造成的危害 (6 分)?

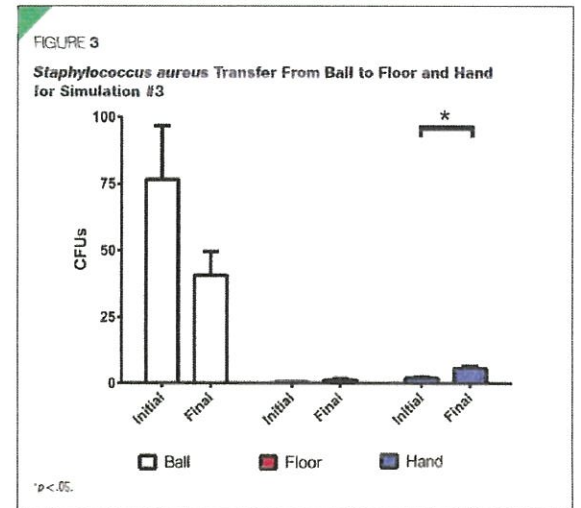
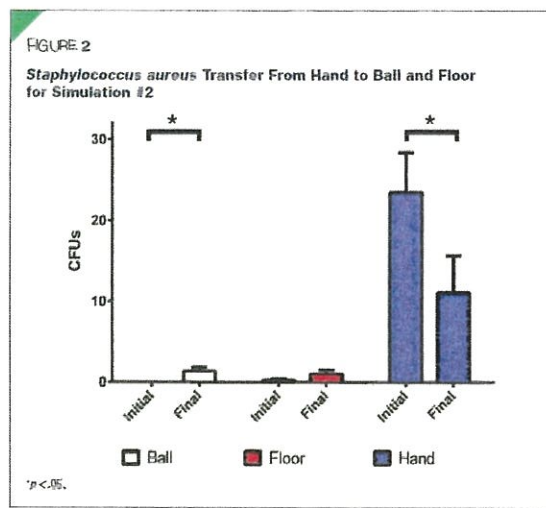
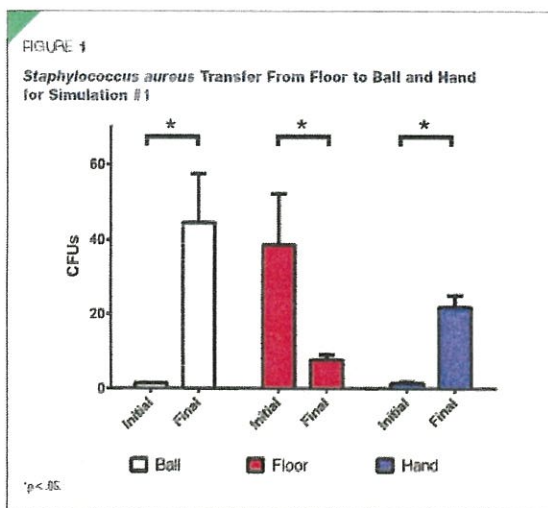
2、人類活動對環境造成衝擊，長久以來造成全球環境變遷，其中全球暖化一直是大家關切的問題。請問全球暖化如何直接或間接地對人類造成影響 (6 分)? 哪些措施可以減緩全球暖化 (6 分)?

3、毒性化學物質會造成健康危害，但對每個人的危害程度不盡相同，試說明造成個體差異的可能原因 (10 分)。

4. Please read the abstract and figures carefully and answer the questions below. (2% per question; total 14%)

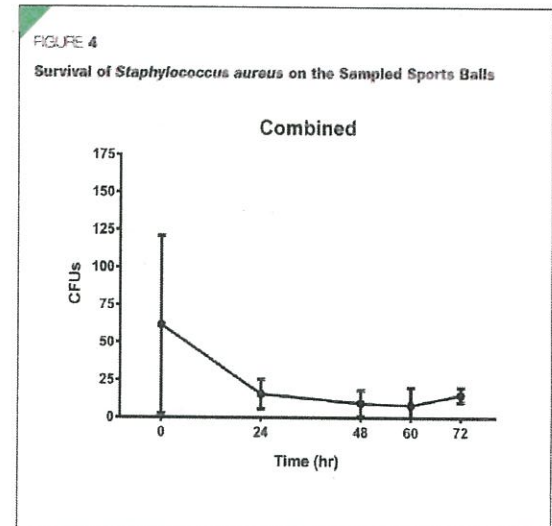
Reference: Brandon A. Haghverdian et al., 2018. The sports ball as a fomite for transmission of *Staphylococcus aureus*. J. Environ. Health. 80 (6): 8-13.

Abstract: Outbreaks of methicillin-resistant *Staphylococcus aureus* (MRSA) are becoming increasingly frequent in the athletic community. Skin fomite contact represents a putative mechanism for transmission of MRSA. The objective of this study was to demonstrate the prevalence and transmissibility of *S. aureus* in three surfaces commonly encountered in the gymnasium setting: the court floor, the sports ball, and the athlete's hands. Three sports scenarios were simulated by dribbling a sports ball within a designated area; the surfaces were cultured before and after play using media selective for *S. aureus*. There was significant transfer of *S. aureus* from the native, contaminated surface towards two disinfected surfaces. In a fourth experiment, survival of *S. aureus* on sports balls was evaluated over time. *S. aureus* was found to be viable on the ball for at least 72 hr. This study demonstrates the significance of the sports ball as a vector for pathogen transmission. Interventions aimed at reducing athletic outbreaks should therefore include routine disinfection of sports balls during and after play.



- (1). The purpose of the study was to examine whether _____ is one of the primary mechanism of community associated-MRSA transmission between athletes. (a) skin-to-skin contact among players with traumatic lesions or abscesses; (b) equipment sharing; (c) poor hygiene.
- (2). In the study, simulation #1 explored *S. aureus* transfer from _____. (a) ball to floor and hand; (b) hand to ball and floor; (c) floor to ball and hand.

- (3). In simulation #1, the average change in CFUs sampled from the _____ was the greatest after play. (a) floor; (b) sports ball; (c) hand.
- (4). Regardless of the difference in texture of the balls, more *S. aureus* would be transferred from the floor to the hand following play with _____ compared with _____ according to the results of simulation #1.
(a) basketballs; volleyballs; (b) volleyballs; basketballs.
- (5). In simulation #2, there was _____ change in CFUs sampled from the floor after play. (a) significant; (b) no significant.
- (6). In simulation #3, a significant increase in CFUs cultured from the _____ was observed following play. (a) sports ball; (b) floor; (c) hand.
- (7). The study then demonstrated the viability of *S. aureus* on sequestered sports balls for 72 hr. (a) True; (b) False.



5. Please explain the following terms (4% each; total 20%):

- (1) Epigenetics; (2) Lipidomics; (3) Sustainable Development Goals (SDGs); (4) Integrated Vector Management (IVM); (5) Emerging contaminants.

6. Please read the essay carefully and answer the questions below. (16%)

Recognizing the complexity of climate change, an ad hoc Interagency Working Group on Climate Change and Health (IWGCCH) assembled to develop a white paper on relevant federal research and science needs, including research on mitigation and adaptation strategies. The purpose of this paper is to identify research critical for understanding the impact of climate change on human health so that we can both mitigate and adapt to the environmental effects of climate change in the healthiest and most efficient ways.

This report is organized around 11 broad human health categories likely to be affected by climate change. (1) *Asthma, Respiratory Allergies, and Airway Diseases*; (2) *Cancer*; (3) *Cardiovascular Disease and Stroke*; (4) *Foodborne Diseases and Nutrition*; (5) *Heat-Related Morbidity and Mortality*; (6) *Human Developmental Effects*; (7) *Mental Health and Stress-Related Disorders*; (8) *Neurological Diseases and Disorders*; (9) *Vector-borne and Zoonotic Diseases*; (10) *Waterborne Diseases*; (11) *Weather-Related Morbidity and Mortality*.

- (1) Please explain the relationship between categories of (4), (9), (10), (11) and climate change.
- (2) Please identify the basic and applied research needs of the four categories, as well as cross-cutting issues where relevant.