國立成功大學
111學年度碩士班招生考試試題

編　號：305

系　所：醫學檢驗生物技術學系

科　目：檢驗醫學

日　期：0220

節　次：第 1 節

備　註：不可使用計算機

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※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. 若要開發新冠病的快篩試劑，應該利用何種檢驗原理？IgM 與 IgG 的差別為何？（10 分）
2. 請問 BluePoint 晶片可以用來檢驗何種病原？其檢驗原理為何？（10 分）
3. 疫情期間，我們每天都會聽到感染者的病毒檢驗 Ct 值，請問什麼是 Ct 值？要利用何種檢測方法，才能測得病毒的 Ct 值？(10 分)
4. 唐氏症的成因為何？該如何檢驗？要注意檢體的什麼特徵？（5 分）
5. 何種細菌可以利用吹氣法檢測？原理為何？（5 分）
6. 組織檢體若要進行病理檢驗，採檢後，組織應該經過哪些處理，才能在顯微鏡下觀察？（10 分）
7. A 51-year-old man originally from Republic of Georgia presents with known HCV. He believes he contracted the virus during medical or dental procedures prior to emigrating to the US. Per report, his HCV was previously shown to be genotype 2. A liver biopsy in 2009 showed active chronic hepatitis with periportal and focal septal fibrosis. Treatment with pegylated interferon alfa plus ribavirin was attempted but stopped prior to completion due adverse drug reaction. Subsequently he took a 12-week course of sofosbuvir plus ribavirin and demonstrated an on-treatment response, but relapsed 12 weeks after treatment discontinuation. He currently complains of fatigue, decreased appetite, and depression, but denies abdominal bloating or distension, nausea, emesis, melena, hematemesis, changes in stool color, jaundice, pruritis, changes in mental status, or lower extremity swelling.

   (1) What feature of his presentation is unusual for chronic infection with hepatitis C virus? (10%)

   A. His chronic infection with HCV genotype 2 resulted in disease progression as demonstrated by histology.
   B. He experienced severe side effects during treatment for chronic hepatitis C virus infection with pegylated interferon alfa plus ribavirin.
   C. His HCV infection relapsed in the follow-up phase after sofosbuvir plus ribavirin treatment.
   D. He was largely asymptomatic despite histologic evidence of liver damage.

   (2) Given his country of origin, what test would be recommended to verify his HCV genotype? (10%)

   A. Direct Sanger sequencing of core and E1 genes
   B. Real-time PCR test that amplifies 5'UTR and NS5B sequences
   C. Reverse hybridization/line probe assay querying 5'UTR and core sequences
   D. Whole genome sequencing with NGS technology

8. A 70-year-old male presented to the emergency department in February with a four-week history of fever, dyspnea, productive cough, and fatigue. He has also reported experiencing rhinorrhea over the past week, but denied any sinus pain or pressure. He did not have a sore throat, chills, night-sweats, skin changes, abdominal pain, other gastrointestinal symptoms, vision changes, or peripheral edema. He was seen by his local primary care provider and prescribed a course of azithromycin, which he completed a week prior to presentation without clinical improvement. He denies any allergies and did not receive the influenza vaccine this year. His past medical history is notable for acute erythroid leukemia, status post reduced intensity conditioning allogeneic peripheral blood stem cell transplant from an HLA-matched donor performed one year prior. Post-transplant prophylaxis consists of acyclovir,

posaconazole, and pentamidine. His post-transplant course was complicated by chronic graft-versus-host disease involving his skin, scalp, and mouth. This was initially treated with intravenous corticosteroids then transitioned to oral prednisone, which he continues on at present (20 mg daily). At the time of admission, the patient's temperature was 38.4°C and he was hypotensive. Bibasilar crackles were noted on auscultation of his lungs. A CT scan of the chest showed bilateral ground glass opacities, most prominent in the right upper lobe. He was hypoxemic and required 2 liters per minute of oxygen via nasal cannula to maintain oxygen saturation >90%. His laboratory tests were remarkable for WBC 6.33 X 10^9 /L (normal: 4.5-11 X 10^9 /L) , ANC 5.01 X 10^9 /L (normal: 1.78-5.38 X 10^9 /L) , hemoglobin 8.7g/dL (normal: 14-17g/dL), platelets 280 X 10^9 /L (normal: 150-350 X 10^9 /L), total bilirubin <0.2 mg/dL (normal: 0.3-1.2 mg/dL), ALT 17 units/L (normal: 0-35 units/L), AST 29 units/L (normal: 0-35units/L) and lactate 1.3 mmol/L (normal: 0.67-1.8mmol/L).

Which of the following is least likely to be the causative infectious agent? (10%)

A. Respiratory syncytial virus (RSV)
B. Cytomegalovirus (CMV)
C. Human Metapneumovirus
D. Influenza virus

9. An 83-year-old woman presented to the emergency department in November due to loss of consciousness following a fall in the nursing home, and she was admitted to the hospital for observation. Overnight, she developed sudden right-sided vision loss, hemiplegia, and hemisensory loss in her right extremities, alongside respiratory decline requiring supplemental oxygen. Per the nursing home, she was otherwise healthy without illness over the past 2 to 3 months; although, she was diagnosed with shingles approximately 4 months prior to her current admission. Her past medical history is notable for diabetes mellitus, hypothyroidism, vitamin B12 deficiency, and breast cancer status post lumpectomy and adjuvant radiation therapy in 1999, now in remission. Magnetic resonance imaging of the brain showed an ischemic infarct near the left posterior vertebral artery. The patient was worked up with blood and urine cultures, all of which were negative. A lumbar puncture was performed on day 2 of hospital admission, and the cerebrospinal fluid (CSF) was notable for slightly elevated protein (60 mg/dL; normal: 15-45 mg/dL), mononuclear cell pleocytosis (15 cells/mm^3; normal: <5 cells/mm^3), and normal glucose levels. HSV and VZV RT-PCR testing on the CSF were negative. A presumptive diagnosis of VZV-associated vasculopathy was made based on history and presentation. The patient was started on intravenous acyclovir and oral prednisone with neurologic improvement over the next 2 weeks.

Which of the following statements regarding VZV vasculopathy is true? (10%)

A. Neurologic manifestations of VZV reactivation do not occur without a history of prior zoster rash.
B. VZV vasculopathy typically occurs within 1 month of VZV reactivation.
C. VZV vasculopathy often presents without abnormalities on brain imaging.
D. Confirmation of VZV vasculopathy is most frequently established by a VZV antibody index.

10. A 51-year-old female, originally from Iran and residing in the United States for the last 35 years, presented for evaluation of symptoms consistent with myelopathy. The patient had been healthy until a trip to Japan and Taiwan one year prior. She described hurting her left shoulder while carrying heavy luggage and had several weeks of a tingling sensation and a tremor of the left extremity. Upon returning to the US, she was evaluated by a local physician and diagnosed with essential tremor. She continued to experience paresthesia of the upper and lower extremities, and her symptoms progressed to slowness of gait, lower extremity weakness, and imbalance requiring the use of a cane. An MRI of the cervical spine showed spinal canal stenosis concerning for cord compression, but no demyelinating lesions were observed. However, it was noted that the degree of symptoms seemed disproportionate to the degree of stenosis. She underwent additional studies to rule out neoplasm, multiple sclerosis, paraneoplastic myelopathy, and other autoimmune demyelinating diseases, all of which were unrevealing. Her symptoms continued to progress and she presented to our institution for further evaluation of her increased weakness, stiffness of the lower extremities, and continued sensory disturbances. Repeat CSF analysis showed an elevated total nucleated cell count of 14 cells/uL, (reference value 0-5 cells/uL) with 98% lymphocytes, elevated total protein of 56 mg/dL (reference range 0-35 mg/dL), and glucose of 47 mg/dL, which was within the expected range. Additional CSF studies including bacterial, fungal, and mycobacterial cultures, PCR for HSV 1/2, VZV, and enterovirus, VDRL, arbovirus antibodies, and cytology examination were all negative. HIV screening and RPR were also negative. Physical examination revealed spasticity and hyperreflexia of the lower extremities bilaterally. With the evidence gathered, an inflammatory or infectious etiology was favored in the differential diagnosis of this progressive myelopathy, and the patient was seen several times for continued evaluation and testing. Additional history surfaced during evaluation revealing that the patient's husband had tested positive for HTLV-1 antibodies during workup for a blood donation, and so the patient was subsequently tested. The HTLV-1/-2 ELISA antibody screen was reactive and the Line Immunoblot Assay for confirmation and discrimination detected HTLV-1, both in serum and CSF. A qualitative HTLV-1/-2 DNA real-time PCR (RT-PCR) performed on CSF was also positive. The patient was notified of the results, and management was coordinated with specialists in neurology and infectious diseases.

Which of the following is not a mode of transmission for Human T-lymphotropic virus type 1? (10%)

A. Transfusion of plasma blood products
B. Vertical transmission
C. Transfusion of cellular blood products
D. Sexual contact
E. IV Drug Use