JOURNAL-BASED LEARNING EXERCISES

IBMS CPD

Each article's contents should be read, researched and understood, and you should then come to a decision on each question. The pass mark is 17 out of 20 questions answered correctly. JBL exercises may be completed at any time until the published deadline date. Please select your choice of correct answers and complete the exercises online at: www.ibms.org/cpd/jbl

DEADLINE WEDNESDAY 6 JUNE 2018

Antibacterial and antifungal activity of chitosan coated iron oxide nanoparticles. Nehra N, Chauhan RP, Garg N, Verma K. *Br J Biomed Sci* 2018; **75**(1): 13-8. Assessment No 030118

Revised 2017 international consensus on testing of ANCAs in granulomatosis with polyangiitis and microscopic polyangiitis. Bossuyt X, Cohen Tervaert JW, Arimura Y *et al. Nat Rev Rheumatol* 2017; **13**(1): 683-92. Assessment No 030518

#	Left	#	Right
01	Nehra *et al.* attribute the low number of potential reactive sites in nanoparticles (NPs) as one of the reasons they are of interest as potential antibacterial agents.	01	The availability of reliable antigen-specific immunoassays has raised doubts as to whether the two-stage diagnostic strategy currently recommended for ANCA detection is the best approach.
02	The authors speculate that the increased antimicrobial activity of chitosan-coated iron oxide (Fe_3O_4) NPs can in part be contributed to chelating metal ions and by enhancing enzyme activity.	02	In a 2016 large multicentre study by the European Vasculitis Study Group (EUVAS), the diagnostic performance of antigen-specific immunoassays was confirmed to be inferior to the diagnostic performance of IIF.
03	NPs with a size greater than 100 nm have consistent chemical properties.	03	In the early 1990s, classification criteria and nomenclature for the small-vessel vasculitides were assigned by the American College of Rheumatology and the Chapel Hill Consensus Conference (CHCC) respectively.
04	Cost-effectiveness is one aspect contributing to the popularity of Fe_3O_4 NPs.	04	Efforts in harmonising ANCA detection began in 1983 with an international study on the standardisation of ANCA assays.
05	The crystal structure of synthesised nanoparticles was analysed using infrared spectroscopy.	05	The EUVAS study concluded that screening with IIF and follow-up testing with antigen-specific immunoassay was not necessary for maximal accuracy.
06	According to the authors, antibodies are unsuitable surface-coating agents.	06	In patients where there is a high degree of clinical suspicion and negative ANCA test results, testing by another method can be useful to increase sensitivity.
07	The authors concede that one of the limitations to the study was the small number of isolates tested.	07	The specific role of IIF testing in ANCA testing algorithms should be determined individually by diagnostic laboratories on the basis of the specific clinical need and circumstances of the laboratory.
08	With reference to Figure 3d, amphotericin B performed significantly better than the chitosan-coated Fe_3O_4 NP and the chitosan polymer.	08	If a laboratory prefers to use IIF as a screening assay in locally determined best-testing algorithms, they need to ensure the IIF operates at a high level of sensitivity, as the performance of IIF varies greatly between laboratories.
09	Hazardous solvents are required for the synthesis of Fe_3O_4 NPs when using coprecipitation processes.	09	ANCAs are also found in 3% to 8% of patients with EGPA, a disease characterised by asthma, eosinophilia and granulomatous inflammation.
10	Overall, the study showed that surface modification of Fe_3O_4 NPs by chitosan improved antibacterial properties.	10	A gating policy for requesting an ANCA test is advisable and adherence to clinical guidelines for ANCA testing (BOX 2) is recommended.
11	Surface-coating agents are used to avoid aggregation due to high surface energy.	11	The clinical usefulness of ANCAs in IBD is well established.
12	Chitosan consists of between three and five types of functional groups.	12	Our consensus recommendations are applicable to AAV, and also to gastrointestinal disorders.
13	Fe_3O_4 NPs were synthesised for use in the study based on a previously published method.	13	The paper states a recommendation that high-quality immunoassays for PR3 ANCAs and MPO-ANCAs are the preferred methods for the diagnostic evaluation of patients with AAV, without the categorical need for IIF.
14	The results obtained and shown in Figures 1a and 1b confirm the coating of chitosan affects the crystal structure of Fe_3O_4 NPs.	14	In a series of 30 patients with AAV associated with cocaine use, all patients had PR3-ANCA and 50% had MPO ANCAs.
15	The authors suggest evidence exists to show that the small sizes of NPs are responsible for the bacteriostatic properties they demonstrate.	15	The combination of an ASCA-negative and P ANCA-positive test result is associated with Crohn's disease, whereas the combination of an ASCA-positive and P ANCA-negative test result is associated with ulcerative colitis.
16	The authors report that images obtained using scanning electron microscopy indicate that chitosan-coated Fe_3O_4 NPs were spherical in shape with a diameter range of 8-20 mm.	16	Knowledge of test result-specific likelihood ratios can help clinicians and laboratory professionals to better interpret results.
17	With reference to Figure 3a, the chitosan polymer performed significantly better than chitosan-coated Fe_3O_4 NP.	17	A likelihood ratio is the probability of a specific result occurring in a group of patients divided by the probability of the same result occurring in a group of controls.
18	Results of the study showed that chitosan polymer showed excellent antifungal properties.	18	An ANCA gating strategy strongly reduces the number of ANCA test requests and improves diagnostic performance, with fewer false-positive results.
19	Although the NPs in the study show antibacterial properties, the authors do not claim that this makes them suitable for microbial-resistant coatings.	19	Depending on the assay, 9% to 16% of patients with AAV were negative by IIF and 11% to 17% by immunoassay. Hence, antigen-specific immunoassays might detect antibodies that are missed by IIF, and vice versa.
20	The authors tested the antimicrobial properties of three species of fungus, namely *Candida albicans*, *Aspergillus niger* and *Fusarium venenatum*.	20	The use of a certified reference material will reduce variability between ANCA results obtained with different assays, as autoantibodies are a uniform analyte.

REFLECTIVE LEARNING

#	Left	#	Right
01	The study carried out was in response to the increased emergence of resistance to antimicrobial agents. With reference to your local data, which species of bacteria are proving problematic with regard to resistance patterns seen?	01	Critically appraise the sensitivity and specificity of immunoassay and IIF assays for ANCA testing in AAV.
02	Should nanoparticles prove to be a worthwhile alternative for some organism/antibiotic combinations, what would be the issues incorporating this type of technology into a routine NHS microbiology laboratory?	02	Review your gating strategy of ANCA requests in your laboratory. How would this affect your workload in terms of activity and time for reviewing requests?