HIV AND AIDS

CU characterization:

CU name:

HIV and AIDS

Scientific area acronym:

BM

Duration:

Quarterly

Working hours:

84

Contact hours:

22

ECTS:

3

Observations:

N/A

Teacher in charge and respective teaching load in the CU:

João Piedade – 20.5 hours

Other teachers and respective teaching load in the CU:

Ricardo Parreira – 7.5 hours

Intended learning outcomes (knowledge, skills and competences to be developed by the students):

After this unit, students should be able:

1. To know the main characteristics of the *Retroviridae* family, including the specificities of human retroviruses and related pathologies.
2. To describe the human immunodeficiency virus (HIV) and to understand the different steps of its replication cycle.
3. To interpret the phylogenetic relationships among Primate immunodeficiency viruses and to infer about the biological origin of HIV-1/HIV-2.
4. To recognize the biological mechanisms generating genetic variability in retroviruses and their consequences.
5. To describe the natural history of HIV infection, relating to the host immune response and understanding the immunopathogenic mechanisms of infection.

HIV AND AIDS

6. To interpret different algorithms for diagnostics/laboratory monitoring of HIV infection and to select the tests to be carried out according to different objectives.
7. To select and to apply screening enzyme immunoassays (ELISA and rapid tests) and confirmatory tests (Western blot) in the diagnostics of HIV-1/-2 infection.

Syllabus:

I. Family *Retroviridae*. Human retroviruses and associated pathologies. Virion morphology and genome organization. Replication cycle. The human immunodeficiency virus (HIV).

II. Biological origin and phylogenetic relationships of HIV-1/HIV-2 to Primate lentiviruses. Zoonotic-like transmission. Evolutionary trends of the pandemics.

III. Genetic variation and molecular epidemiology. Biological mechanisms of variability. Quasispecies. Types, groups, subtypes and sub-subtypes of HIV. Mosaic viruses, unique recombinant forms and circulating recombinant forms. Worldwide geographical distribution of the different types, groups and viral subtypes: causes and effects. Molecular epidemiology of HIV infection in Portugal.

IV. Natural history of infection. Host immune response. Acute infection, chronic infection and AIDS. Opportunistic infections.

V. Genetic diversity and resistance to antiretrovirals (ARVs). Concept of "virological failure". Factors involved in the emergence of resistance. Drug targets and drug classes. Infection monitoring: ARV susceptibility testing. Genotypic and phenotypic tests: fundamentals, interpretation and main advantages and limitations.

VI. Diagnostics in HIV infection. Immunoenzymatic and immunochromatographic tests (ELISA and rapid tests) and confirmation tests (Western-blot and nucleic acid tests). WHO and CDC algorithms. Special cases: direct detection of the virus (PCR, RT-PCR, p24 antigenaemia). In vitro viral isolation.

Evidence of the syllabus coherence with the CU intended learning outcomes:

In the first part of the course (theoretical component) the latest data on the topic "HIV and AIDS" will be presented, after cautious selection of specific contents by addressing the course objectives and in accordance with the competencies to be acquired by the students. The topics to be covered will come from general concepts (e.g. HIV as a retrovirus) to more specific ones, but with practical significance (e.g. the impact of viral genetic diversity on antiretroviral therapy). It is intended that the learning path is traversed from theoretical concepts to the selection and judicious application of selected laboratory methods, applied to particular situations, in order to address specific problems (e.g. diagnostics, monitoring of infection). The course will culminate with a practical laboratorial session that seeks to simulate real situations in the context of the diagnostics of HIV infection. In short, we believe that the syllabus is fully aligned with the learning objectives set in advance for the course.

Teaching methodologies (including assessment):

The total contact hours (22 hrs.) will be distributed by four lectures (12 hrs.), theoretical and practical sessions (2 hrs.), a class of laboratory practice (4 hrs.) and a tutorial (2 hrs.). A total workload of about 84 hrs. is expected for the student. Not considering specific exceptions provided for in applicable legislation, admission to the final assessment requires a minimum

HIV AND AIDS

attendance of 2/3 of the programmed face-to-face sessions. The final assessment will be carried out through a final written exam (2.5 hrs.), consisting of different type of questions, e.g. multiple choice, true/false, space filling, subtitling, essay questions (100% of the final grade). For approval, a minimum classification of 9.50 is required. In case of doubt about the possible practice of plagiarism or fraud, an oral test may be carried out, the result of which prevails over another previously obtained.

Evidence of the teaching methodologies coherence with the CU intended learning outcomes:
Theoretical classes/lectures will consist of alternating periods of formal lecturing and free open discussion, in order to stimulate students' critical thinking and a substantial active participation in the learning process. At the same time, students will also be directed to the most relevant literature in the area, in a process aiming at an active search for relevant bibliographical sources. During the practical session, students will work in small, semi-autonomous groups, but in the presence of tutors, in order to apply previously acquired theoretical knowledge to day-to-day real problems. Throughout the course, it is intended to use a dynamic teaching-learning methodology, trying to stimulate the interaction and active participation of students, in order to pave the way to relevant learning and research tools. Finally, considering that this is a short course, a single moment of assessment was devised (summative written exam, structured on different types of questions).

References for consultation / mandatory existence:

- Alexander TS (2016). Human immunodeficiency virus diagnostic testing: 30 years of evolution. Clin. Vaccine Immunol., 23:249-53.
- Brun-Vézinet F, Charpentier C (2013). Update on the human immunodeficiency virus. Méd. Mal. Infect., 43:177-84.
- Cortez KJ, Maldarelli F (2011). Clinical management of HIV drug resistance. Viruses, 3: 347-78.
- Hemelaar J (2012). The origin and diversity of the HIV-1 pandemic. Trends Mol. Med., 18:182-92.
- Hurt CB, et al. (2017). Selecting an HIV test: a narrative review for clinicians and researchers. Sex. Transm. Dis., 44:739-46.
- Kuritzkes DR, Walker BD (2007). HIV-1 pathogenesis, clinical manifestations and treatment. in “Fields Virology”, pp. 2187-2214. Knipe DM et al. (eds.), Wolters Kluwer Health e Lippincott Williams & Wilkins, Philadelphia, EUA, 5ª Ed.
- Okulicz JF (2012). Elite controllers and long-term nonprogressors: models for HIV vaccine development? J. AIDS Clinic. Res., 3:139. doi:10.4172/2155-6113.1000139.
- Peeters M, et al. (2013). The origin and molecular epidemiology of HIV. Expert Rev. Anti Infect. Ther., 11:885-96.
- Pépin J (2011). The origins of AIDS. Cambridge University Press, Cambridge, Reino Unido.
- Sharp PM, Hahn BH (2011). Origins of HIV and the AIDS pandemic. Cold Spring Harb. Perspect. Med., 1:a006841.

HIV AND AIDS

- Sierra S, et al. (2005). Basics of the virology of HIV-1 and its replication. J. Clin. Virol., 34:233-44.
- Tebit DM, Arts EJ (2011). Tracking a century of global expansion and evolution of HIV to drive understanding and to combat disease. Lancet Infect. Dis., 11:45-56.