

**CONCORSO PUBBLICO, PER ESAMI, A N. 1 POSTO DI CATEGORIA D, POSIZIONE ECONOMICA D1, AREA TECNICA, TECNICO-SCIENTIFICA ED ELABORAZIONE DATI, PER LE ESIGENZE DEL CENTRO INTERDIPARTIMENTALE DI RICERCA IN SCIENZE IMMUNOLOGICHE DI BASE E CLINICHE (CISI) DELL'UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II (COD.RIF. 2305), INDETTO CON DECRETO DEL DIRETTORE GENERALE N. 297 DEL 22.03.2023**

**Prova orale del 19/07/2023**

**TRACCE ESTRATTE**

**PROVA 1**

**Primo quesito**

Il/la Candidato/a descriva le caratteristiche dei fenotipi dei neutrofili unami “low density” e “high density”

**Secondo quesito**

Il/La candidato/a i principali utilizzi del software Excel della suite Microsoft Office

**Terzo quesito**

Neutrophils have historically been purified using various density gradients, followed by their characterization through flow cytometry analysis based on cell surface markers or through tissue examination to assess morphological features, including nuclear shape, cell size, and the presence of granules containing various enzymes and antimicrobial molecules. This approach has been used to characterize neutrophil development from granulocyte–monocyte progenitors in the bone marrow, which mature into myelocytes and eventually into mature neutrophils that are released into the circulation. Recent advances in single-cell technologies have enabled researchers to analyse neutrophil heterogeneity and neutrophil dynamics with unprecedented granularity, revealing the presence of distinct transcriptional subsets in health and disease in both humans and mice<sup>8·9·10·11·12·13..</sup>

## PROVA 2

### **Primo quesito**

Il/la Candidato/a descriva la “gate strategy” per identificare sottopopolazioni di neutrofili

### **Secondo quesito**

Il/La candidato/a illustri i principali utilizzi del software Word della suite Microsoft Office

### **Terzo quesito**

In healthy, steady-state conditions, neutrophils are released from the bone marrow into the blood and generally circulate for less than a day in humans and mice, although there is evidence that some cells can remain in the blood for several days<sup>14,15</sup> (Fig. 1). Their fate after being released from the circulation remains a matter of debate and may depend on the inflammatory state of the host. During their time in blood circulation, the surface marker expression and protein cargo of neutrophils change as they age, including increased cell-surface expression of the chemokine receptor CXCR4. This allows for the infiltration of neutrophils into tissues and their removal from circulation<sup>16</sup>. Indeed, several tissues are infiltrated by neutrophils under conditions of homeostasis — in particular, spleen, lungs and liver<sup>4,12</sup>. Although evidence is mainly from mouse models, these tissue-resident neutrophils likely function as sentinels ready to respond to invading microorganisms, primed by the local microenvironment

### PROVA 3

#### **Primo quesito**

Il/la Candidato/a descriva le caratteristiche pro-infiammatorie ed anti-infiammatorie dei neutrofili

#### **Secondo quesito**

Il/La candidato/a illustri i principali utilizzi del software Power Point della suite Microsoft Office

#### **Terzo quesito**

Upregulation of CXCR4 expression in aged neutrophils allows for their retention in the bone marrow and lymphoid tissues, where they are engulfed by macrophages as a clearance mechanism<sup>18</sup>. This cycle is markedly controlled by the circadian rhythm, with the rhythmic control of neutrophil clearance in the bone marrow being regulated in a cell-intrinsic manner by clock genes, but is also affected by external factors such as glucocorticoid signalling and bacterial metabolites<sup>19,20,21</sup>. As aged neutrophils produce higher levels of reactive oxygen species (ROS) and have an increased tendency to form NETs compared with neutrophils newly released from the bone marrow<sup>16,20</sup>, this circadian rhythm of neutrophil clearance ensures that the innate immune system is more responsive during the awake part of the day when there is a higher likelihood of encountering microorganisms, followed by a refractory phase during sleep

## PROVA 4

### **Primo quesito**

Il/la Candidato/a descriva la metodica dell' "High Content imaging Analysis"

### **Secondo quesito**

Il/La candidato/a descriva le modalità di importazione di un'immagine in una presentazione del software PowerPoint della suite Microsoft Office

### **Terzo quesito**

Recently, neutrophil subpopulations in healthy humans and mice have been described, including a subset of neutrophils that express higher levels of type I interferon-stimulated genes (ISGs) than other neutrophil subsets<sup>10,13,23</sup>. Although the physiological and/or pathogenic roles of this interferon-responsive neutrophil subset remain to be determined, it is possible that they represent primed cells that may more readily combat infections and/or patrol the blood. It is not known, however, if such neutrophil subsets are epigenetically committed in the bone marrow or result from exposure to particular stimuli in the periphery. The interferon-responsive subset is expanded in patients with severe COVID-19 and can be abrogated by dexamethasone treatment, which suggests that it might be associated with disease pathology<sup>24</sup>

## PROVA 7

### **Primo quesito**

Il/la Candidato/a descriva le caratteristiche tecniche delle diverse linee cellulari di tiroide

### **Secondo quesito**

Il/La candidato/a descriva come creare animazioni in una presentazione del software PowerPoint della suite Microsoft Office

### **Terzo quesito**

Neutrophils use several strategies to contain and kill microorganisms. A central component of killing microorganisms is their ingestion into neutrophil phagosomes and the fusion of phagosomes with intracellular lysosomes, creating phagolysosomes that can kill and degrade invading pathogens under controlled conditions. The intracellular vesicles of neutrophils store various cytotoxic enzymes, proteins and peptides that are ready to be released into the phagolysosome<sup>36-37</sup>. Another component of the neutrophil response is activation of the NADPH oxidase machinery, which produces a respiratory burst through ROS production, creating highly reactive superoxide anions that can destroy many structures. These neutrophil functions can be applied on both intracellular vesicles and extracellular targets by degranulation<sup>36</sup>. In fact, they are so central to host defence that disruption of these processes causes severe immunodeficiency<sup>38-39</sup>.

## PROVA 8

### **Primo quesito**

Il/la Candidato/a descriva le mutazioni genetiche nelle linee cellulari 8505C e TPC

### **Secondo quesito**

Il/La candidato/a illustri l'utilizzo della modalità "conteggio parole" all'interno del software Word della suite Microsoft Office

### **Terzo quesito**

NETs are composed of nuclear and granule contents that can entrap and kill fungi, bacteria and viruses<sup>40-41</sup>. Most often, NET formation involves a lytic type of programmed cell death of neutrophils but, less frequently, it can also proceed without affecting the integrity of the cell membrane or immediate neutrophil death<sup>41-42</sup>. NET formation can be initiated by various stimuli, including microorganisms and their products, cytokines, immune complexes, autoantibodies, crystals, chemicals and platelets<sup>34-43-44-45</sup> (Fig. 2). Exposure to these signals eventually leads to the disassembly of the neutrophil cytoskeleton, decondensation of chromatin and citrullination of histones, and assembly of granule contents such as myeloperoxidase (MPO) and neutrophil elastase on the DNA scaffold of both genomic and mitochondrial DNA.

SU ORDINE DEL PRESIDENTE

F.to Il segretario

Sig. Mario De Matteis