

Visual analogies in anatomic and clinical pathology

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Abstract

Visual medical analogies have been utilized by multiple medical disciplines for decades. Despite misgivings that some might have about such analogies, they act as excellent learning aids and will undoubtedly remain useful for decades to come.

The microscope from about the seventeenth century onwards revolutionized medicine and cellular biology. In this article, we specifically consider in a pictorial essay culinary medical analogies as they pertain to the microscopic world, a gap in the literature on visual medical analogies.

Key words

Microscope, pathology, metaphor, analogy, food

Introduction

Culinary medical analogies have found favor in a variety of medical disciplines including dermatology [1,2], pathology [3-5], pediatrics [6,7], obstetrics/gynecology [8] and radiology [9,10]. As individuals, food-derived medical metaphors offer familiarity and humor to an often tedious field bogged down with memorization and complex algorithms.[6,11,12] There is no doubt that these terms, despite reservations that others might have, are powerful learning aids that will continue to fascinate and entertain medical teachers and learners for years to come.[13]

The microscope has revolutionized medicine and cellular biology since its introduction sometime in the seventh century. The father of cellular pathology, Rudolf Virchow, was a great proponent of the microscope.[14] Previous literature on culinary medical analogies in pathology has focused mostly on gross aspects.[3-5] In a pictorial essay, we uncover the culinary medical analogies that can be found within the microscopic world. Like a well-balanced meal; respiratory, gynecologic, hematologic, infectious disease and other microscopic food-related findings are blended for satisfaction. In this savory survey, the diverse menu includes a complex range of foods, including fried eggs, spices, grapes, oats and more.

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Figure 1. Coffee bean nuclei. In benign but sometimes malignant ovarian Brenner tumor, named after Fitz Brenner (1877 – 1969), some of the nuclei have a longitudinal groove similar to the groove found in coffee beans.[15]

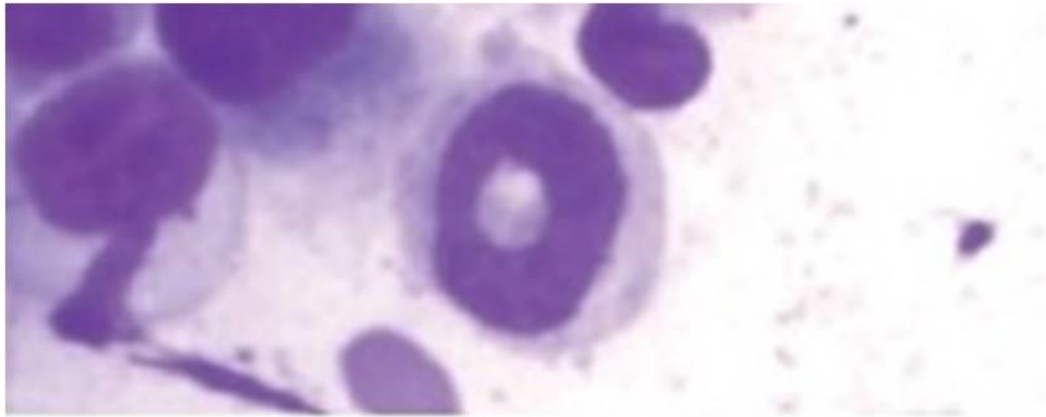


Figure 2. Doughnut cell. In the rare T-lymphocyte cancer, anaplastic large-cell lymphoma, some of the nuclei are ring-shaped with a central lucent region, resembling a doughnut.[16] Photo credit. Singh S et al (upper panel).



Figure 3. Oat cell carcinoma. Small cell lung carcinoma cells have a relatively large nucleus, similar in shape and structure to oat grains.[17]

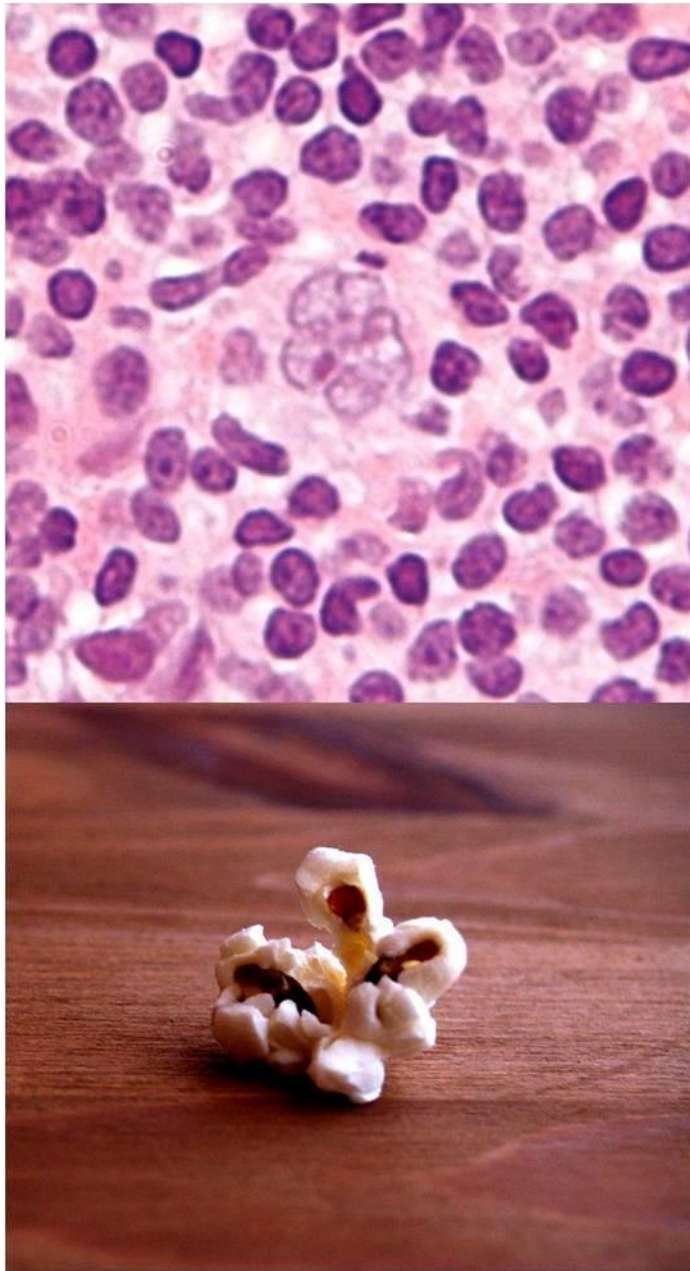


Figure 4. Popcorn cell. Nodular lymphocyte predominant Hodgkin lymphoma, named after Thomas Hodgkin (1798 – 1866), can have nuclei with a lobulated form similar to a popcorn kernel.[18]

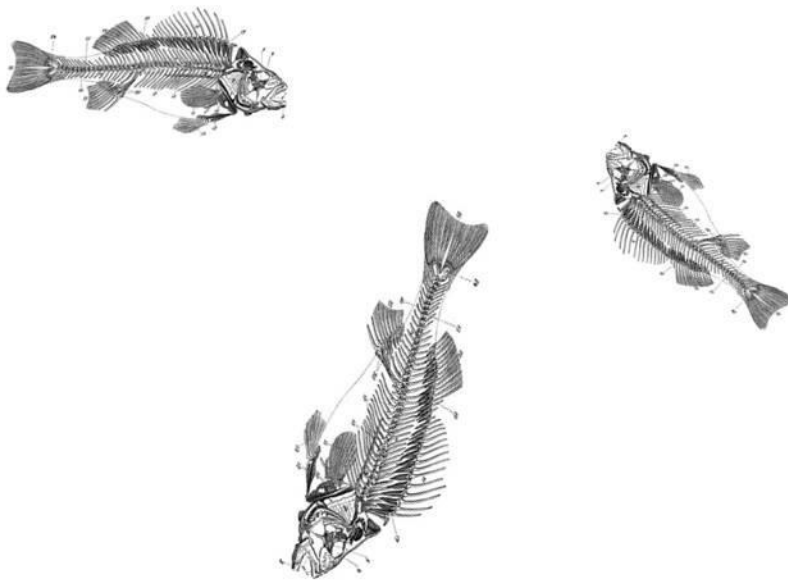
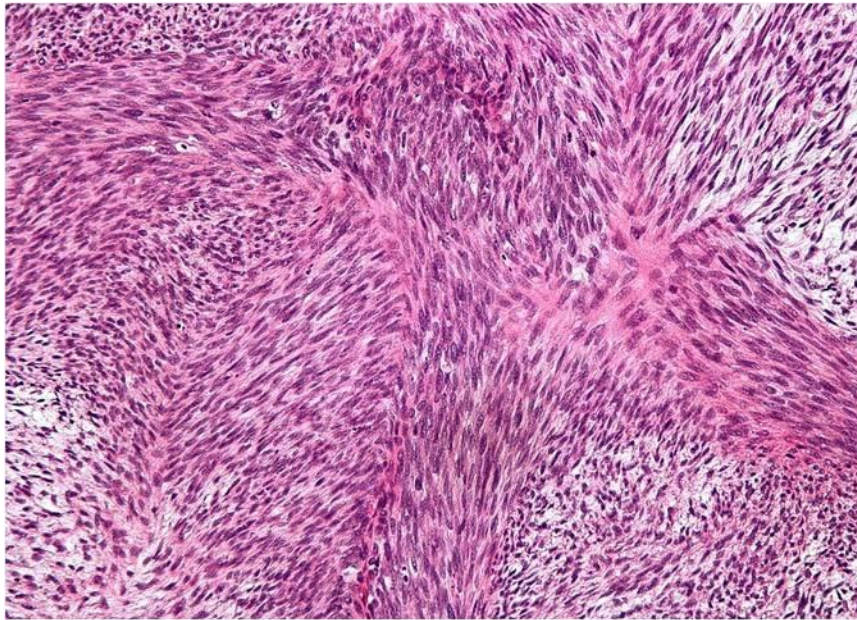


Figure 5. Herringbone pattern. Groups of cells in fibrosarcoma are arranged in parallel patterns that resemble the skeleton of a herring.[19]

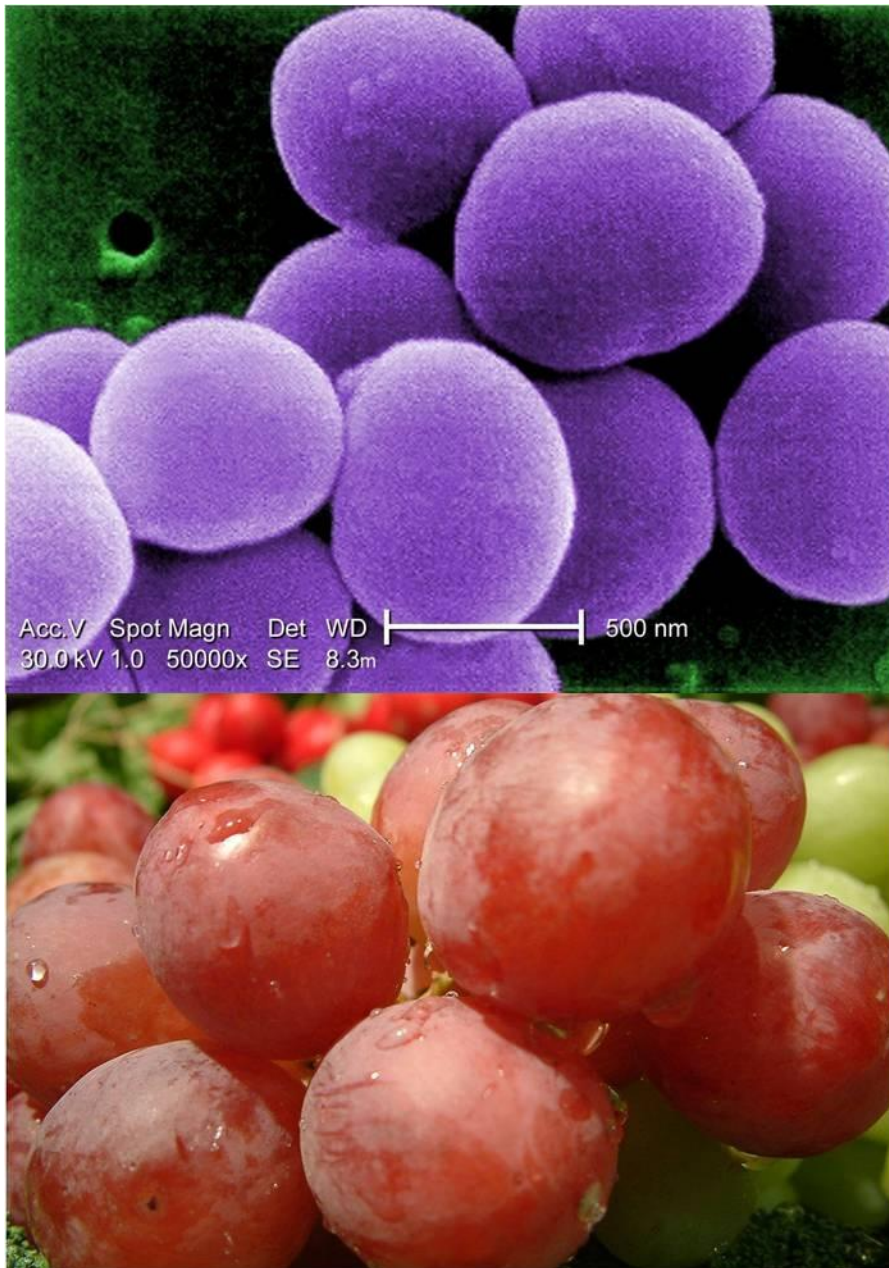


Figure 6. Grape bunches. *Staphylococcus aureus* are spherical bacteria known as cocci that grow in clusters that look like grape bunches, especially obvious on electron microscopy as above.[20]



Figure 7. Fried egg nuclei. Hyperchromatic round nuclei surrounded by a clear zone in oligodendrogloma give the appearance of a fried egg with a yellow yolk surrounded by egg whites.[21]



Figure 8. Spaghetti and meatballs appearance on KOH prep. On potassium hydroxide preparation, the filamentous hyphae and round spores of *Tinea versicolor* resemble spaghetti and meatballs respectively.[22] Photo credit. Andrade-Filho Jde S (upper panel).



Figure 9. Swiss cheese appearance. The multinodular mass with solid regions between multiple cysts in juvenile papillomatosis of the breast can resemble the popular variety of Swiss cheese that is riddled with holes.[23] Photo credit. Breast Journal (upper panel). This image remains under the copyright of the original publication. Permission was provided by the copyright holder for re-use.

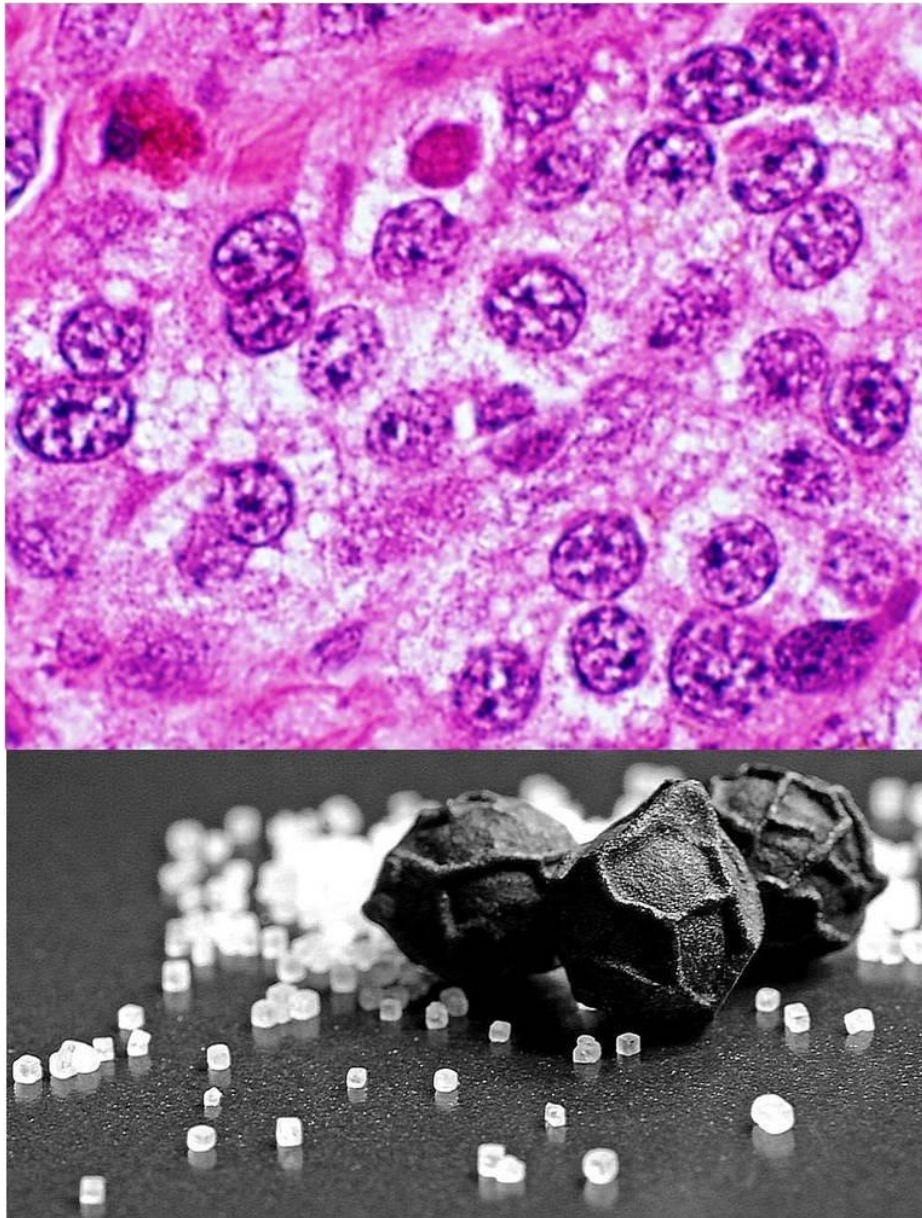


Figure 10. Salt and pepper chromatin. The nuclei in neuroendocrine tumors often show a *salt and pepper* appearance of the coarse, dark chromatin strands which look like pepper in a clear white background which looks like salt.[24]

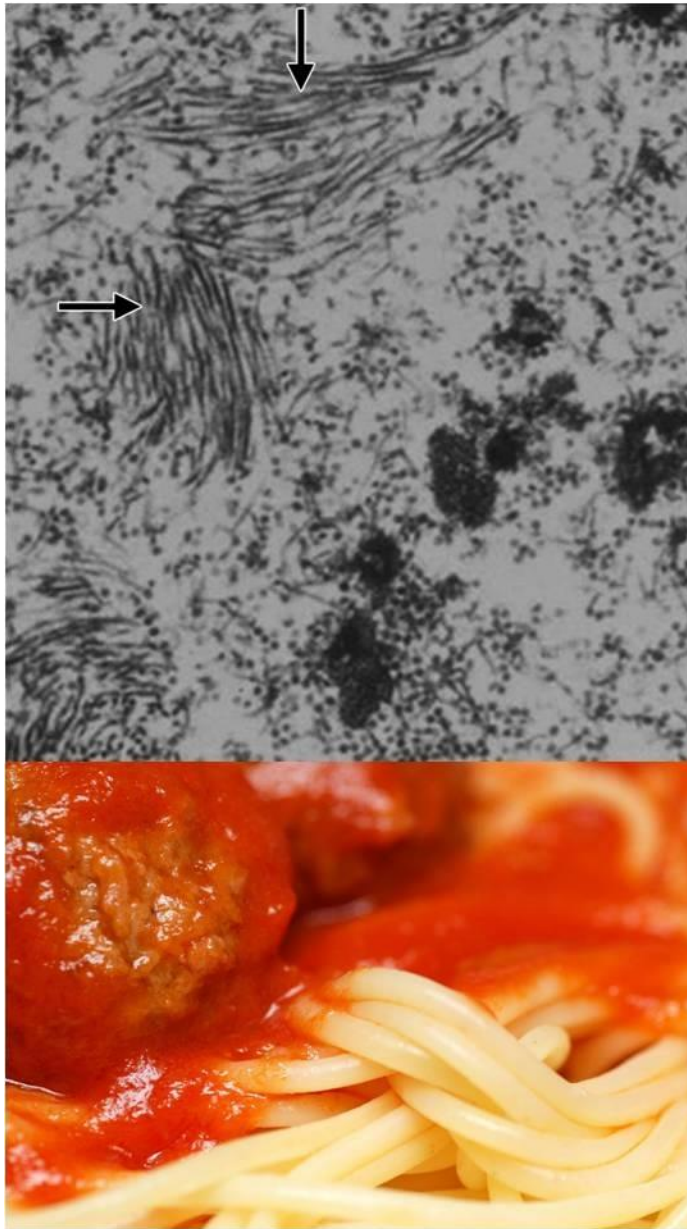


Figure 11. Spaghetti and meatball appearance. JC virus (named after John Cunningham) particles occur in spaghetti-like filamentous and meatball-like spherical forms, imparting a *spaghetti and meatball* appearance.[25] Photo credit. Radiological Society of North America (upper panel).

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Figure 12. Tart cell. When a monocyte has engulfed another cell's nucleus, the second nucleus remains relatively intact making the monocyte look like a tart.[26] Photo credit. Nivaldo Medeiros (upper panel). This image remains under the copyright of the original publication. Permission was provided by the copyright holder for re-use.

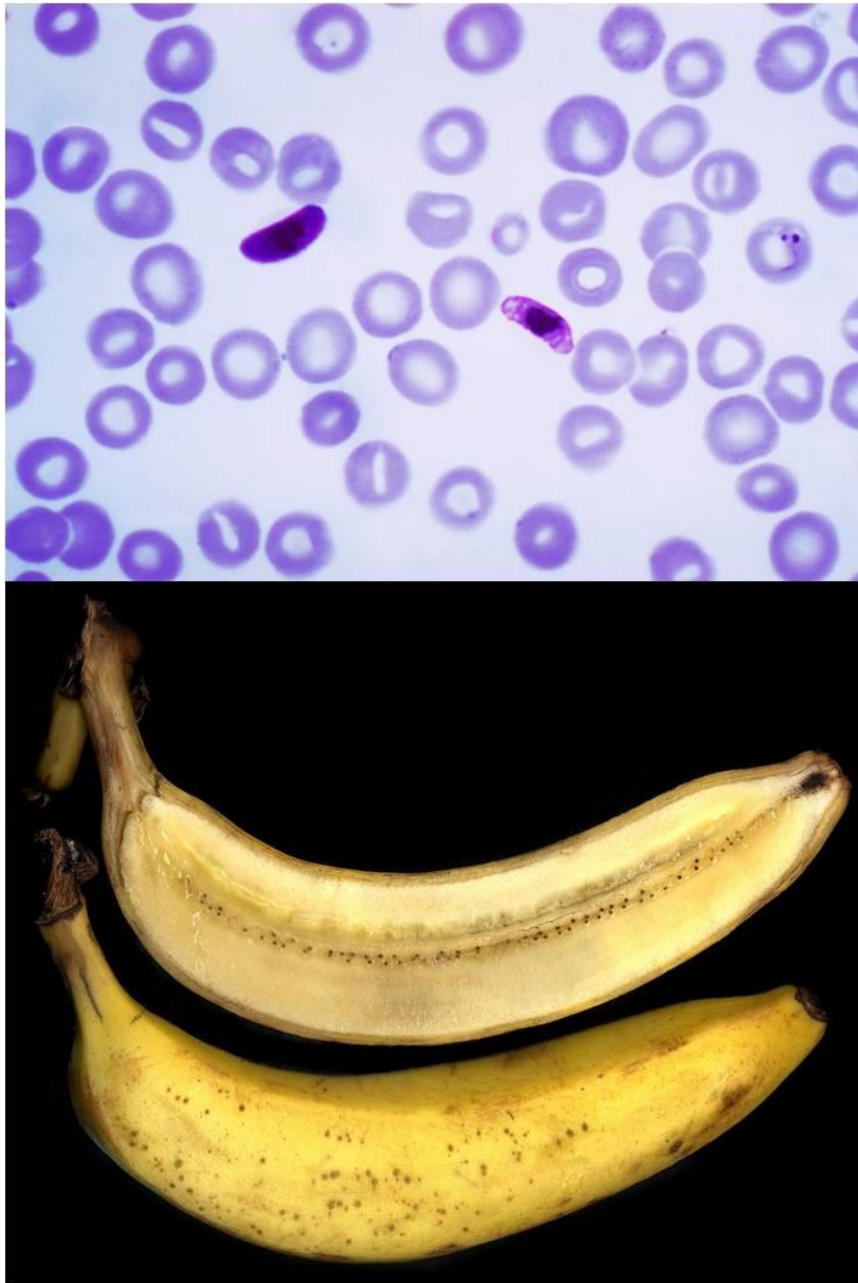


Figure 13. Banana-shaped gametocyte. The sexual form of *Plasmodium falciparum*, which causes serious malaria, has a curved shape like a banana.[27]

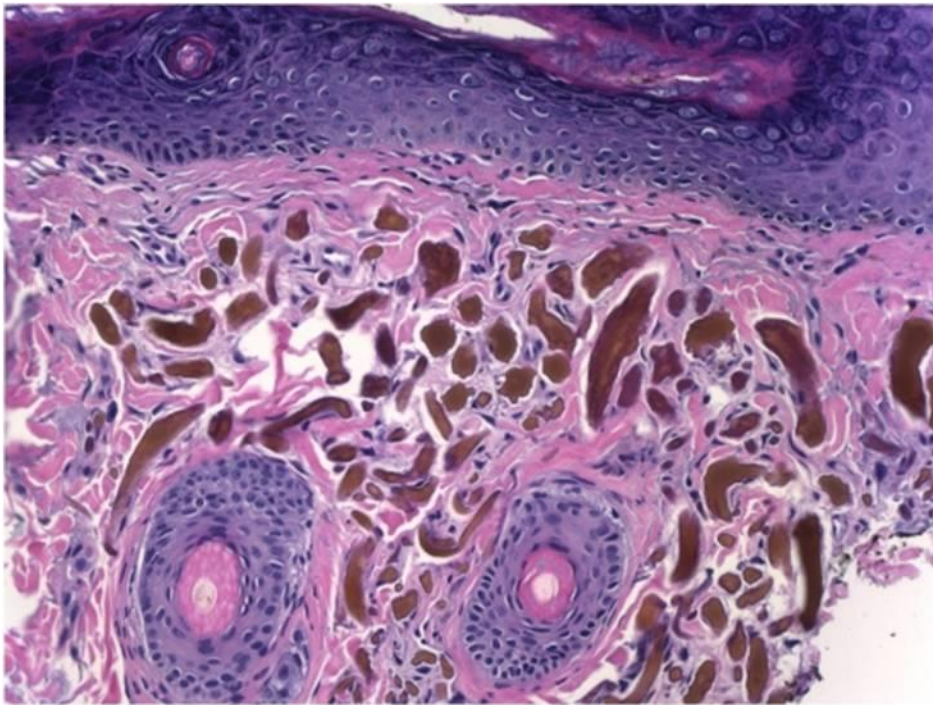


Figure 14. Banana bodies. Banana-shaped yellow to brown deposits in the upper dermis in ochronosis, caused by the accumulation of homogentisic acid in connective tissue.[28] Photo credit. Dermpedia (upper panel), Fir0002/Flagstaffotos (lower panel).

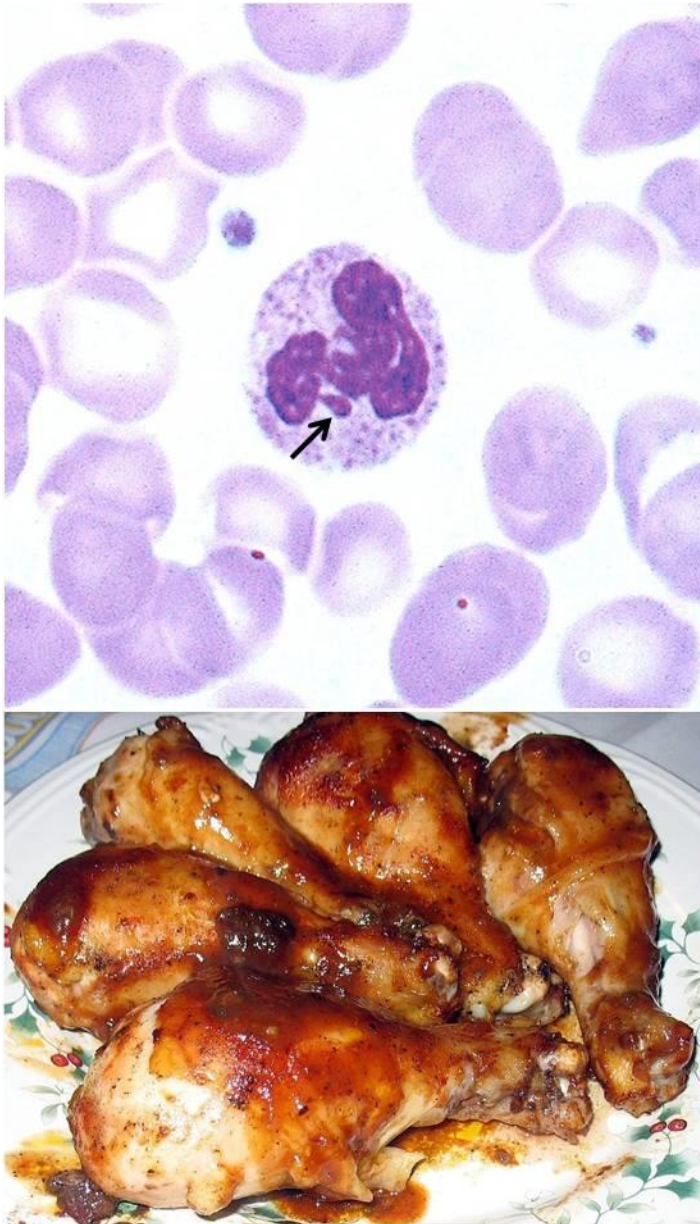


Figure 15. Drumstick appendage. An inactivated X-chromosome, also known as Barr body, of the neutrophil as seen in rare neutrophils in females and caused by lyonization.[29] Photo credit. Blood : journal of the American Society of Hematology (upper panel). This image remains under the copyright of the original publication. Permission was provided by the copyright holder for re-use.

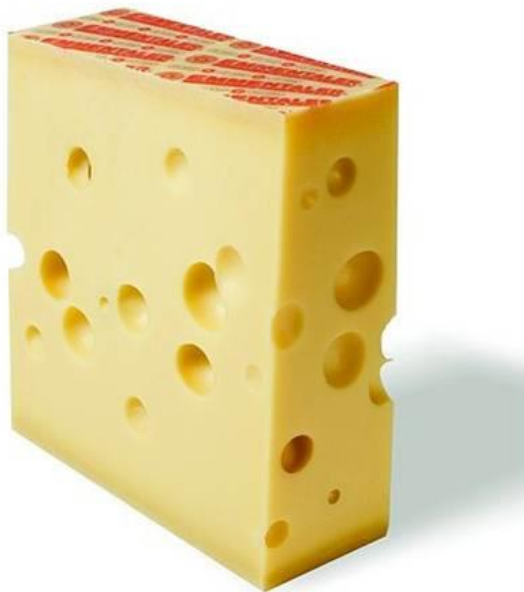
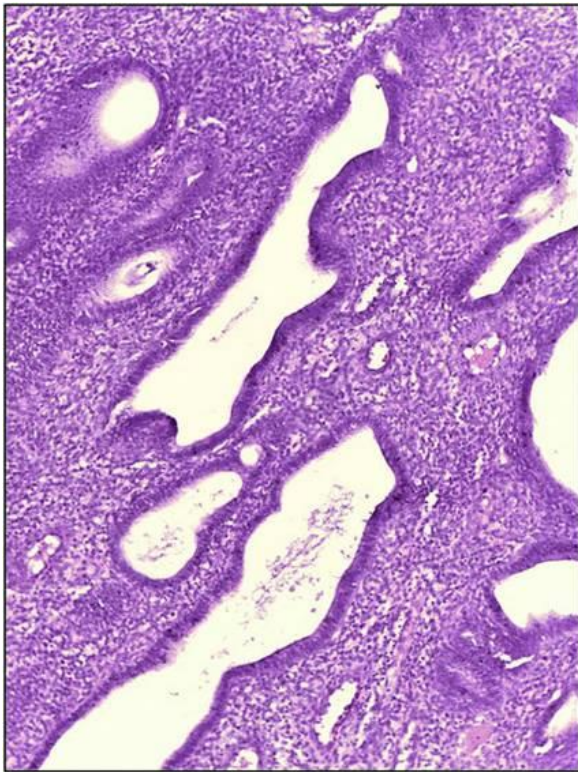


Figure 16. Swiss cheese endometrium. In simple endometrial hyperplasia, dilated and cystic glands can resemble the holes found in the popular variety of Swiss cheese.[8]

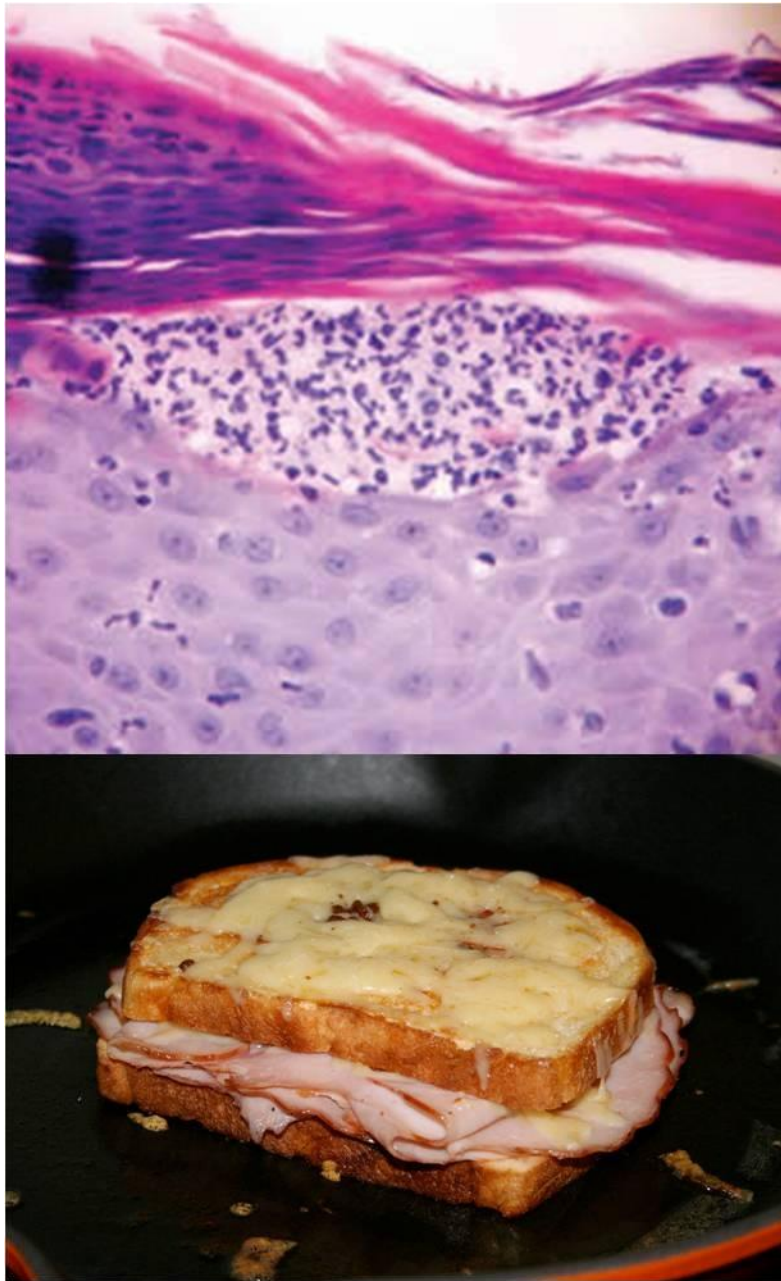


Figure 17. Sandwich sign. In dermatophytosis, fungi are present in the layer between two zones of cornified cells, the upper being orthokeratotic and lower consisting partially parakeratotic cells, giving the appearance of a sandwich.[30] Photo credit. Damevska K and Gocev G (upper panel). This image remains under the copyright of the original publication. Permission was provided by the copyright holder for re-use.



Figure 18. Lollipop or onion. In Castleman disease, the characteristically expanded mantle zone and a radially penetrating sclerotic blood vessel resemble a lollipop on a stick. Similarly, the expanded mantle zone can look like the multiple layers of an onion.[31] Photo credit. Schaefer et al (upper right panel).



Figure 19. Bite cell. Also known as a degmacyte, this type of red blood cell typical in oxidative stress from glucose-6-phosphate dehydrogenase deficiency has a semicircular portion removed from its margin, resembling a bite into the cell.[32] Photo credit. Journal of Clinical and Diagnostic Research (upper panel). This image remains under the copyright of the original publication. Permission was provided by the copyright holder for re-use.



Figure 20. Kidney-bean shaped intracellular diplococcic. The curvature and shape of Neisseria gonorrhoea bacteria resemble kidney beans in pairs with the indentations facing towards each other.[33]

Discussion

It was not possible to be exhaustive, for example, we omitted chewing gum colloid - strands of colloid found on fine needle aspiration cytology specimen from papillary carcinoma of the thyroid which look like stretched out chewing gum [34] and carrot-shaped nuclei - histologic examination of medulloblastoma can demonstrate carrot-shaped hyperchromatic nuclei surrounded by cytoplasm [34]. Also not mentioned is seeing mulberries [36], pears [37,38], shredded wheat [39] and jelly beans.[3]

This pictorial essay was restricted to food; however, pathologists also see improbable things such as the starry night sky [40], comic strip character features [41] and lots more under the microscope.

Although medical terms associated with food and drink are seemingly slowly disappearing [11] from the medical literature we hope our article in part cultivates an enduring taste for them. The language of food is universal.[42]

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Author contributions

MBC conceived the article. LK and GM wrote the first draft of the article. MBC and RL reviewed the manuscript and made important intellectual contributions. All authors reviewed and approved the final version of the article.

Competing interests

LK, GM, RL and MBC do not operate a food and beverage company that might have a financial interest in this work.

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