Chicken eyes: New state of matter\textsuperscript{\textcopyright}

Ojos de pollo: nuevo estado de la materia

Dear Sir:

Matter has three states or forms of aggregation: solid, liquid and gaseous. When referring to matter and its states, we imagine quantum physicists, chemists and engineers in big laboratories or in particle accelerators to which basic researchers have little or no access. The least we could imagine is physicists describing a new state of matter in the eyes of a common chicken and, what is even more amazing is that it is the first time this order is observed in a biological system. For years, ophthalmologists have used chicken eyes as an animal model in the study of illnesses as important as refractive\textsuperscript{1} ones, particularly myopia, studying their physiology and anatomy, but the new state of matter known as “disordered hyperuniformity”\textsuperscript{2} had not been described until many physicists from different U.S. universities (Princeton University and Washington University in St. Louis) had observed the distribution of the five types of cones in chicken retina. Previously, it had only been observed in physical systems such as liquid helium and simple plasma.

Chickens (active birds during daytime) have four cones susceptible to certain wavelengths (violet, blue, green and red) and a fifth one to detect light levels. Additionally, each type of cone has a different size. Cones arranged in this way seem to have a totally chaotic and disorganised layout, but it is observed that each cone has an exclusion region that avoids contact with other cones and each type of cone has a different exclusion region. Each type of cone is in different layers, one on top of the other, which gives a disordered aspect, but each layer is perfectly organised: this is called “disordered hyperuniformity”, which allows it to behave like crystal or liquid.\textsuperscript{2,3} The advantage of this distribution is that chickens are able to capture light in a more uniform way. With computer models that simulate cone distribution in chicken retina, disordered hyperuniform materials are obtained, which have unique properties when it comes to transmitting and controlling light waves: they are able to transmit light with the efficiency of a crystal and the flexibility of a liquid; this may have an important biotechnological application.

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Post-operative endophthalmitis due to Candida parapsilosis\textsuperscript{\textcopyright}

Endoftalmitis postoperatoria por Candida parapsilosis

Dear Editor:

This is the case of a 65-year-old female patient on treatment for diabetes and hypertension, who underwent surgery in May at an eye centre for cataract surgery, with no complications whatsoever. One month later, the patient visited the centre due to a clinical picture of corneal oedema, with hypopyon and vitreous Tyndall in the anterior chamber, which led to the diagnosis of endophthalmitis; therefore, medical treatment was prescribed. Given patient’s poor progress, a pars plana vitrectomy was performed in September, where the presence of deposits at the lens and capsular bag level was confirmed.

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Since the patient experienced a new recurrence, an explantation of the lens and capsules was performed in November. No information on the responsible pathogen was available. The patient visited another eye institute in the same month for assessment of her eye problem, where an aphakic eye with cystoid macular oedema was detected and treated with topical anti-inflammatory drugs. Eight months later, the patient made an urgent consultation due to loss of sight in her left eye. A reaction to the infectious process with uncontrollable intraocular pressures was observed. Aqueous humour samples were collected and the anterior chamber was washed with vancomycin and ceftazidime; empirical treatment was started with oral levofloxacin and clarithromycin and with topical fluoroquinolones and anti-inflammatory drugs and anti-hypertensive drugs. One month later, there was no remission of infection with intraocular pressures of 34 mmHg. Culture test report showed growth of Candida parapsilosis (C. parapsilosis) susceptible to amphotericin B, voriconazole, fluconazole, fluocytosine and itraconazole. It was recommended to start oral treatment with voriconazole every 12 h followed by levofloxacin and to visit the hospital to receive indications on such medication regimen. At our hospital, the same treatment regimen was maintained with the addition of natamycin. Considering the insidious course, up to five anterior chamber washouts, aspiration of colonies from stroma of cornea and administration of voriconazole injection were performed. New samples of colonies found in the corneal incision were sent for microbiological culture and C. parapsilosis was recovered again using API AUX bioMerieux® (Marcy l’Étoile, France). The antifungal susceptibility test revealed susceptibility to amphotericin B, MIC: 0.25; voriconazole, MIC: 0.64; fluconazole, MIC: 2; and caspofungin, MIC: 0.19. Oral treatment with voriconazole was maintained for one year and photosensitivity was developed at the end of such period. In subsequent follow-up visits, the patient remained asymptomatic after 15 months without treatment.

Postoperative infectious endophthalmitis is a relatively rare disease that occurs approximately in 1 of every 1000 intraocular surgeries. In literature, incidence is not clear, but the most common causes are bacteria, including: Propionibacterium acnes 63%, Staphylococcus epidermidis 16%, and Corynebacterium spp. 5%. Although in rare cases, various different fungi have caused postoperative endophthalmitis, including Candida (C. parapsilosis 16%), Aspergillus and species of Penicillium.1 C. parapsilosis has been associated with invasive ocular disease: endophthalmitis and keratitis.3 In 1983, there was an outbreak of C. parapsilosis endophthalmitis that affected 13 patients who had undergone a cataract surgery in the United States, which was caused by a contamination of eye irrigating solutions.3 A case of exogenous C. parapsilosis endophthalmitis following a penetrating trauma has been described in Spain.4 Given the small number of patients with C. parapsilosis endophthalmitis, treatment has not been standardised.2 It is recommended to treat exogenous endophthalmitis following this sequence: vitrectomy which rapidly decreases fungal load; intravitreal and/or chamber injection of antifungal drug—which ensures high antifungal levels in the eye; removal of intraocular lens (placed during the previous cataract surgery); and systemic therapy with fluconazole or voriconazole.3,5 Voriconazole is a triazole derived from fluconazole with activity against different types of fungi including those resistant to fluconazole. Intravitreal injection of voriconazole seems to be less toxic for the retina than the traditional amphotericin injection. Systemic antifungal therapy in exogenous endophthalmitis is usually recommended, oral voriconazole being the first-choice drug and even active against fungi such as Aspergillus, Paecilomyces and Fusarium. In our patient, aspiration of colonies from the stroma of cornea, anterior chamber washout, intrachamber injection of voriconazole (up to five times), administration of oral voriconazole along with topical corticosteroids were able to control and contribute to full recovery of the infection for more than 15 months. It should be noted that the collection of samples for microbiological culture is necessary to determine the adequate treatment of infections, including endophthalmitis.

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