



Lessons from the *Drosophila* Microbiota

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This issue of the Biomedical Journal includes two reviews discussing how studying the gut of the humble fruit fly can reveal important insight about our own microbial communities. In addition, we focus on work showing that acupuncture may not be the best treatment for idiopathic chronic pelvic pain. Finally, we report on several studies that will hopefully help to optimize surgical techniques, from laser treatment for birthmarks to the design of prostheses for radial head fractures.

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SPOTLIGHT ON REVIEWS – Lessons from the *Drosophila* Microbiota

In the past few years, studies have revealed the power that our resident microorganisms (collectively termed the “microbiota”) have over virtually every aspect of human health, from our physical to emotional well-being.^[1] Although many studies of the microbiota have used vertebrate models, their microbial communities are inherently complex and cannot be cultured entirely. With a gut that is anatomically and physiologically similar to that of mammals, but harbors a simple microbial community of four or five major phylotypes all of which can be cultured,^[2] the humble fruit fly is an ideal system to investigate the influence of the microbiota on development and behavior. This issue of the Biomedical Journal includes two review articles describing how *Drosophila* has improved our understanding of gut immunity and the microbiota.

Reasoning that the immune system of an organism that feeds on rotting fruit must have some pretty interesting properties, El-Chamy *et al.*^[3] first described the innate immune reactions that regulate interactions between the fly and its microbiota. Much of the *Drosophila* gut is protected by an impermeable cuticle, whereas the site of food absorption is covered by the peritrophic matrix (PM),

which allows the passage of digestive enzymes and nutrients, but not bacteria. Studies involving corrosive agents showed that the PM defends against commensal bacteria.^[4] Besides these physical barriers, the toll and immune deficiency pathways regulate the secretion of antimicrobial peptides from fat cells into the hemocoel cavity in response to activated pattern recognition receptors.^[5] Flies also produce large amounts of reactive oxygen species (ROS) via dual oxidase (DUOX) following the ingestion of bacteria,^[6,7] which is an essential part of the anti-microbial defense. Thus, this multilayered system keeps the microbial community in check and protects against infection.

In the second review, Ma *et al.*^[8] discuss the value of gnotobiotic flies as an experimental system. One drawback of the fly microbiota is that it is transient and constantly replenished, such that the microbial community changes drastically with age.^[9] With gnotobiotic flies, the community can be tightly controlled. Experiments in the 1960s demonstrated that fruit fly larvae become colonized with bacteria by eating contaminated chorion.^[10] Therefore, creating germ-free flies is fairly simple, and involves sequential washes with bleach and ethanol to dechorionate the embryo and eliminate contaminants. From there, a single or several microbial species can be added at the

desired stage of development to study the effect of specific microbes on various aspects of fly life [Figure 1].

In addition to the firmly established observation that the microbiota promotes growth in flies, Ma *et al.* describe several studies showing that it also influences behavior, as in mammals.^[11] For example, fruit flies preferentially mate with individuals fed on the same diet, but this phenomenon is lost in germ-free flies. However, the addition of *Lactobacillus plantarum* in gnotobiotic models restores this behavior, suggesting that the microbiota affects pheromone secretion.^[12] Moreover, flies appear to be preferentially attracted to food processed by gnotobiotic larvae associated with *Lactobacillus brevis* or *L. plantarum* and not that processed by germ-free larvae or food spiked with either bacterium.^[13] This implies that the interaction between these bacteria and their host produces a volatile compound that attracts flies, possibly directing them to a hospitable habitat with suitable food for mating and egg laying.

Thus, despite the differences between the mammalian and fly gut, *Drosophila* provides a simplified and pertinent system in which to uncover the dynamics of an eon-long relationship between animal and microbe.

SPOTLIGHT ON ORIGINAL ARTICLES – Is Acupuncture the Best Treatment for Chronic Pelvic Pain?

Acupuncture is commonly used to treat chronic pelvic pain (CPP), but high quality, prospective, and randomized clinical trials testing the effectiveness of this approach are often lacking. In this issue of the Biomedical Journal, Amin *et al.*^[14] report that blockade of the inferior hypogastric plexus is a more effective treatment than acupuncture for CPP.

It goes without saying that pain with no identifiable physiological cause is difficult to treat. Yet, this is the situation for many women suffering from CPP, defined as non-cyclic pain in the pelvis or anterior abdominal wall lasting over 6 months. In such cases, the pain is often attributed to an unrecognized dysfunction of the nervous system.

Although acupuncture has been reported to provide pain relief, acupuncture studies often have many problems, including unscientific protocols. Prospective studies are thus needed to compare the efficacy of this technique with that of different treatments.

Amin *et al.* prospectively selected 117 women with idiopathic CPP and randomly assigned them to one of two groups. Fifty-five women were treated by acupuncture twice weekly for 6 weeks. The remaining 62 women underwent a procedure called inferior hypogastric plexus blockade, which involves blocking the branch of nerves that supplies the organs of the pelvic cavity through a fluoroscopy-guided needle using a combination of contrast agent and local anesthetics. Pain was assessed using the visual analog scale before treatment and at 2, 4 and 12 weeks after treatment.

Although both groups reported a significant reduction in pain throughout the follow-up period, pain levels were reduced to a greater extent in the inferior hypogastric plexus blockade group than in the acupuncture group. Moreover, the proportion of patients who reported that the intervention had no effect on their pain was significantly higher in the acupuncture (31%) than in the inferior hypogastric plexus blockade group (10%).

Therefore, inferior hypogastric plexus blockade provides better results than acupuncture for the treatment of CPP. Although inferior hypogastric plexus blockade has been proven to be effective and safe for the diagnosis and treatment of CPP,^[15] it requires specialist training and expertise in fluoroscopy. However, with a reported success rate of 73% in this study, women with CPP may wish to swap acupuncture needles for this procedure.

ALSO IN THIS ISSUE: REVIEWS – Mitochondria in Health and Disease

In this review, Kramer and Darley-USmar describe new aspects of mitochondrial function and discuss recent developments in basic and translational research into mitochondrial diseases.^[16]

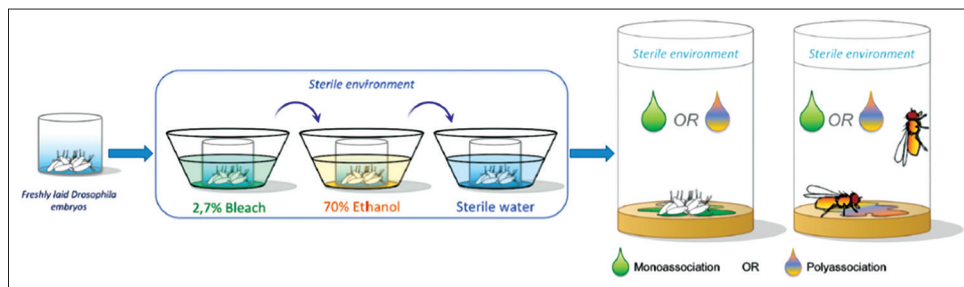


Figure 1: Protocol for creating gnotobiotic flies. Germ-free flies are obtained by successive washes of eggs in bleach, ethanol, and water. The dechorionated eggs are then grown in a sterile environment or with antibiotics. Gnotobiotic flies are then created from germ-free larvae or adults by adding one (green drop) or several (multi-colored drop) gut commensal bacteria. Figure adapted from Ha *et al.*^[6]

ORIGINAL ARTICLES – Common Weed Shows Surprising Anti-inflammatory Properties

Plants have provided us with some of our most effective medications including quinine and morphine.

As a testament to this largely untapped source of bio-active compounds, Chen *et al.*^[17] show that extracts of the common tropical weed *Euphorbia hirta* may contain molecules capable of preventing the secretion of prostaglandin E2 by mammalian cells in culture.

High Prevalence of Thyroid Disorders among Women in Saudi Arabia

Thyroid disorders are estimated to affect around 2–5% of people worldwide.^[18] In this report, Refaat investigates for the first time their prevalence among women of childbearing age living in Saudi Arabia.^[19] This analysis identifies thyroid disorders as a common problem in this population, with around 20% of the 600 women tested showing thyroid dysfunction, which was frequently associated with anemia.

Morphometric Analysis of the Radial Head

Gupta *et al.*^[20] measured precisely several morphometric parameters of the radial head in 50 adult radial bones. Their analysis will help orthopedic surgeons to select the most appropriate radial head prosthesis following a fracture.

Prognostic Factors for Deadly Cancer

Non-small cell lung cancer (NSCLC) involving the mediastinal lymph nodes is a particularly deadly form of cancer, which is treated surgically in many cases although no clear consensus exists regarding surgical management. In this retrospective analysis of 108 patients with resectable NSCLC, Hsieh *et al.*^[21] show that lobectomy improves 5 years survival rates and identify additional prognostic factors for overall survival.

Keeping Crowns in Place

Correct preparation of the underlying tooth can make the difference between a dental crown that stays in place and one that dislodges during chewing. “Crown resistance form” is defined as the multitude of factors related to the preparation of the tooth that affect the stability of the crown. In this *in vitro* study of 60 human teeth, Huang *et al.*^[22] investigated the effect of proximal grooves and abutment height on resistance and show that an abutment height of 3 mm provides adequate resistance for single-cast crowns.

Optimizing Laser Treatments for Birthmarks

Laser treatment generates a high influx of energy in a short space of time; therefore, studies are required to define precisely the optimal parameters for such treatments. Here, Chang *et al.*^[23] assessed the temperature distribution during flashlamp-pumped pulsed dye laser treatment for patients with port wine stains. In their retrospective analysis of 40 patients, they show that a cryogen spray cooling laser treatment is required to prevent burn injuries at laser powers higher than 7 J/cm².

High Variability in Resection Angle Among Patients Undergoing Total Knee Arthroplasty

When preparing the femur for total knee arthroplasty, most surgeons use an inter-medullary (IM) alignment guide with a fixed angle of resection; however, the angle between the femoral mechanical axis and anatomical axis varies among patients and misalignment can lead to transplant failure.^[24] Lee *et al.*^[25] report that first large study to assess the variability of the distal femoral valgus resection angle in ethnic Asian patients with endstage osteoarthritis and genu varum deformity. In their retrospective analysis of 952 knees, 32% of patients had a resection angle outside of the standard 5° ± 2° range, which supports the use of a preoperative scanogram to assess the true angle.

BRIEF COMMUNICATION – Raising Awareness of Family Planning among Indian Women

Choudhary *et al.*^[26] investigated the awareness of family planning methods among pregnant women in North India and show that more education regarding contraception is required in these communities.

CORRESPONDENCE – Predictive Score for Detecting Type II Diabetes

Bhadoria *et al.*^[27] investigated the ability of the Indian Diabetes Risk Score (IDRS) which takes into account age, abdominal obesity, family history of diabetes, and physical activity,^[28] to detect patients with undiagnosed type II diabetes in a population of 911 Indian individuals. An IDRS cutoff of 40 had the highest predictive value, with a sensitivity of 60% and a specificity of 71%.

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