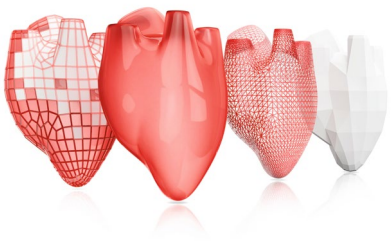
BIOENGINEERING

Bioprinting a human heart

Science **365**, 482–487 (2019)



Credit: Sergii Iaremenko / Science Photo Library / Getty Images

Collagen can be 3D-printed to recreate functional components of the human heart.

Direct 3D bioprinting of human cells has the long-term goal to generate tissues and organs appropriate for transplant in cases of organ failure. But this has been limited by the ability to support human cells and the surrounding extracellular matrix during the printing process, reducing the ability to generate high-resolution structures.

Collagen is the main component of the extracellular matrix, and Adam Feinberg and his colleagues developed a new technique to print collagen that they term freeform reversible embedding of suspended hydrogels (FRESH). Gelation of the collagen is regulated by pH to generate fine structures into which cells can be embedded. They were able to print heart valves, vascular-like networks and a beating model of a human ventricle using this technique. *HS*

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CANCER

The worldwide burden of childhood cancer

Lancet https://doi.org/10.1016/S1470-2045(19)30339-0

An analysis of the distribution of the burden of childhood cancer indicates that it disproportionately affects resource-poor regions.

The measurement disability-adjusted life years (DALYs) accounts for both morbidity and mortality of disease, and is a useful metric for comparing across diseases and populations. While survival rates for childhood cancer have improved in high-income countries, this has not translated to low- and middle-income countries, and an understanding of DALYs in these regions could provide a basis for adequate resource and healthcare provision for childhood cancers.

Using data from the Global Burden of Diseases, Injuries and Risk Factors Study (GBD) 2017, Lisa Force and colleagues provide an estimate of DALYs due to childhood cancer worldwide, including in those countries with scarce data. Their finding that burden disproportionately affected low- and middle-income countries provides a basis for increased efforts in these countries. *HS*

https://doi.org/10.1038/s41591-019-0586-0

INFECTIOUS DISEASE

Nosocomial transmission of antibiotic resistance

Nat. Microbiol. https://doi.org/10.1038/s41564-019-0492-8

A genomic survey of carbapenemen-susceptible *Klebsiella pneumonia* in Europe reveals that the majority of resistance to these drugs stems from carbapanemase acquisition, some of which can be attributed to in-hospital acquisition.

Carbapenam-resistant *K. pneumonia* is the fastest growing antibiotic-resistant bacteria in Europe, and the World Health Organization lists it as a critical priority for which new antibiotics are needed. However, the origin and transmission settings of the epidemic are not well characterized.

The European Survey of Carbapenemase-Producing Enterobacteriaceae (EuSCAPE) analyzed genomic data obtained from greater than 1,700 *K. pneumonia* samples from patients in 244 hospitals in 32 countries. They find that the resistance largely stems from acquisition of carbapanemase, and that much of the acquisition stems from within-hospital and between-hospital transmission within countries. *HS*

https://doi.org/10.1038/s41591-019-0589-x

MICROBIOME

Predicting pancreatic cancer survival via the tumor microbiome

Cell **178**, 795–806, 2019

The tumor microbiome composition is altered in those with long versus short pancreatic adenocarcinoma (PDAC) cancer survival.

Prognosis upon PDAC diagnosis is poor, although there is a subset of individuals that survive longer. The reasons for this discrepancy are unknown, although there is potentially an influence of the immune system on survival linked to the tumor microbiome.

Florencia McAllister and her colleagues analyzed the microbiomes from tumors of long-term survivors and short-term survivors of PDAC. They found the microbiomes of long-term survivors were more diverse and had a specific bacteria signature. Furthermore, the group found evidence of cross-talk between human gut and tumor bacteria, and based on this they performed human fecal microbial transplants into mouse models of the disease, differentially altering tumor growth and immune profile—indicating a possible mechanism for bacteria to regulate tumors. *HS*

https://doi.org/10.1038/s41591-019-0587-z

NUTRITION

Diet influence on cancer therapy

Nature **572**, 397–401 (2019)

Diets restricted in methionine increase therapeutic response in therapy-resistant cancers in mice.

Tumor metabolism is known to be altered compared with that in normal tissue, and thus far this reliance on altered metabolic pathways is a somewhat untapped resource for cancer therapy development.

Jason Locasale and his colleagues found that mice fed a methonione-restricted diet had altered tumor metabolism such that patient-derived xenografted and autochthonous tumors were more susceptible to chemotherapy and radiation. The metabolic changes were echoed in healthy humans fed a similar diet. *HS*

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