Nobel laureate session

The road to cure is strewed with bioethical issues – perspectives from the COVID-19 pandemic

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Bioethics and medical practice have always been intertwined, and the growing role technology plays in medicine has tightened the linkage. From the end-of-life (the time that surrounds death), euthanasia, and abortions all the way to genetic editing and the information about our future health embedded in our individual genomes – the road to development of therapeutic modalities has been strewed with bioethical blocks. The recent Pandemic has floated to the surface few, among them: (i) how to prioritize whom to ventilate; (ii) postponement of other burning global issues like climate change or treatment of patients with other maladies; (iii) the anti-vaccines movement; (iv) the infodemic – the pandemic of disinformation and misinformation; and last but not least, (v) the rise of discrimination and racism. Recognizing these problems is the first step to attempt solving them, though the solutions might be different in different nations, as historical, traditional, religious and national considerations always play a role in handling such sensitive issues.

Combating hunger and climate change with biotechnology

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As the earth warms and its population rises there is an urgent need for technical solutions to tackle both. Fortunately, improvements in plant and agricultural techniques can be extremely helpful, both in improving crop yield and helping to mitigate CO2 and CH4 emissions and increasing yields. Already we have seen many ways in which biotechnology can improve the productivity of plants by incorporating pest resistance genes and improving their nutritional value. The main problem at the moment is the non-scientific disdain afforded to GMOs, by the so-called green movements. The political interference they have caused has led to ridiculously stiff regulations governing the introduction of GM crops. I will present examples of both current and potential improvements that are within reach. One thing is very clear. Europe will need these improved crops and the political influence of non-scientists needs to cease, if the whole world is to benefit from biotechnology in the way they benefitted from its application to vaccine production during the COVID-19 crisis.

Towards an understanding of Alzheimer's disease as a synaptic disorder

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In many neurodegenerative disorders, including Alzheimer's Disease (AD), synapses are affected early during pathogenesis. Multiple mutations in APP and presenilin genes cause rare cases of familial AD, while the ApoE4 variant of the ApoE gene represents the strongest genetic risk factor for sporadic AD in the general population. APP and presenilin gene mutations are thought to induce AD pathogenesis by overproducing pathogenic Abeta variants, and ApoE4 is thought to influence Abeta clearance, but how Abeta might incite AD pathogenesis and how ApoE4 might predispose to AD pathogenesis remains incompletely understood. Moreover, compelling evidence implicates microglial and possibly astrocytic dysfunction in AD pathogenesis. We have taken a cell-biological approach to addressing these questions with a focus on synapses because of their prominent role in AD, recognizing that synapse impairments in AD may be primary results of the pathogenic process in AD, but could also be secondary to microglial dysfunction. We have examined how pathogenic APP mutations, chronic impairments of presenilin function, or ApoE4 may act on synapses, using human neurons trans-differentiated from ES and iPS cells as a model. Instead of searching for potential Abeta receptors (of which many have been reported) or studying the effects of ApoE4 on Abeta (which still remain unclear despite decades of study), we have examined the signaling processes associated with pathogenic mutant forms of APP, by inhibition of presenilins, or by ApoE. Our studies suggest that APP, presenilins, and ApoE4 dramatically affect synapse function, albeit in a differential manner, indicating that synapses may represent a common pathway for different genetic conditions promoting AD pathogenesis.