

Erling Norrby: Nobel Prizes and nucleic acids. A drama in five acts

Act. 1. The cell nucleus contains unique molecules. Nuclein, later called nucleic acids, discovered by Friedrich Miescher. Possible role of the nucleic acids in chromosomes and for transfer of hereditary properties.

Act 2. Proteins are complex and large molecules. Their content of 20 different amino acids allows an enormous variability. By way of contrast nucleic acids are rather monotonous molecules with only four different bases, incorrectly assumed to be represented in equimolar amounts. Proteins are even proposed to be the complete infectious virus. Most likely they represent the genes.

Act 3. Nucleic acids are also macromolecules and they can show variability. Over a 15 years period (1944-1958) data accumulate that eventually define nucleic acids as carriers of the genetic information. Critical actors are Avery, Hershey, Watson & Crick, Gierer & Schramm, Fraenkel-Conrat, Lederberg, Ochoa & Kornberg, Brenner and others.

Act 4. The genetic code is deciphered. Reading the books of life allows the identification of protein-coding genes. Proteins regain the stage and are central to the focus of interest.

Act 5. RNA can act both as an information carrying molecule and as an operating molecule like an enzyme. Life on Earth must have started with an RNA world. It turns out that a genome, like ours, contains more genes that are non-protein-coding than what there are genes coding for proteins. Much remains to be learnt about the regulation of when, where and how new proteins and functional RNA molecules appear.

And that is not the end of the story. There are levels of regulation in addition to those of the information carrying nucleic acids - epigenetics.