Mini Review

A Theory of Recombinant Virus Particle Formation

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Abstract | A mechanism by which novel virus particles evolve from existing virus particles is described. The control of nucleic acid base order in the new virus particles is discussed. The natural control of virus particles in a metabolism is shown to be hydrolysis of the capsid by monophosphoric acid. Also shown is that for protection against the common cold an individual has ideally to be vaccinated with attenuated versions of the virus particles produced by his or her own cells. Observations supporting the proposals are presented.

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Introduction

Virus particles are constructed of strands of DNA or RNA each of which can be coiled in a clockwise or an anticlockwise direction enclosed within a casing formed from a protein. The direction of coiling being controlled by the arrangement of charged phosphate groups linked to DNA and RNA. The casing is known as the capsid. In some instances, a further layer of a lipoprotein is formed over the protein layer. Different virus particles are classified in different ways such as by the differences in the structure of the protein forming the capsid (haemagluttinnin, H) and the enzyme (neuraminidase, N). The latter is considered to function in the mechanism of virus particle release from a human body cell and whose appearance in the human metabolism results in the formation of antibodies. For example, swine influenza is classified as an H1N1 virus. Alternatively, virus particles are named in relation to the effect caused, such as severe acute respiratory syndrome coronvirus-2 (SARS-CoV-2). The present mechanism by which virus particles are taken to undergo multiplication is, entry into the intracellular fluid of human body cells, removal of the capsid, release of the DNA or RNA strands, replication of the latter and reformation of the protein or protein-lipid capsid coating around both the original and newly formed strands. The mode of entry through the cell membrane by diffusion, enclosure or otherwise is not defined. Alternatively, it has been proposed that virus particles inject the compliment of DNA or RNA only into a cell where replication of the latter and capsid takes place in the invaded cell. In this instance no mechanism is proposed which generates the force necessary to separate and inject the DNA and/or RNA through the cell membrane. In both instances it is assumed that the relevant compliment of amino acids required for capsid formation is available both as the required type and in the required concentration. This need is advanced as the reason virus particles normally enter particular cells. The origin of diversity among virus particles is considered to involve one of the three mechanisms, namely, genome variation, reassortment and recombination (Steel and Lowen, 2014; Domingo and Holland, 1997; Perez-Losada *et al.*, 2015). Variation in a given virus particle genome represents a mutation. Recombination is the combination of two

different strains of the same virus particle in the same cells producing a new virus particle with components of both strains present. Reassortment involves transfer of DNA, RNA or both from one virus to another different virus all in the same cell. An alternative mechanism whereby virus particles multiply has been described (Robertson, 2011). This mechanism is extended below to demonstrate the manner in which novel virus particles can form.

Effects linked to virus particle interaction with human body cells

Virus particles are proposed as entering intracellular fluids by deposition on the membrane/intercellular fluid surface in common with other biochemicals used to produce the cell products and are then transferred through the membrane, in the company of the deposited biochemicals, by continuous dissolving at the inner membrane/intracellular fluid surface (Robertson, 2020). This process requires that the molecular structure and any electric charge associated with the virus particle are compatible with the same characteristics displayed by the membrane. The result is that virus particle types are distinguished one from another by the transfer only through the membrane of particular cells. In addition, virus particles from different animals causing the same debilitating metabolic condition, for example, respiratory conditions such as influenza, all carry the characteristics allowing entry into the same cells of the human body and the reverse. On entry into the blood, intercellular and intracellular fluids of a given metabolism a fraction of the virus particles are ruptured through hydration of the protein capsid by monophosphoric acid present in these fluids releasing the DNA or RNA strands, associated amino acids and amino acid combinations plus polyphosphoric acid. Monophosphoric and polyphosphoric acids present in intracellular, intercellular and blood fluids are reversibly converted one to the other by gain or loss of water and have been identified as the necessary hydration/dehydration reagents in cell intracelluar fluid (Figure 1) (Robertson, 2004). Polyphosphoric acid exhibits dehydration action such as required in protein linkage by removal of H+ and OH-ions. Some of components of the degraded capsid leave the intracellular fluid by extrusion in the manner of cell products identifying the presence of the virus particle, that is, indicating the activation of the human immune system. These products join the same compounds formed from virus particle capsid hydrolysis in the intercellular fluid and blood which also contain monophosphoric acid. This process represents the natural metabolic control mechanism of virus particles. The limited concentration of monophosphoric acid human body fluids at any one time means that only a fraction of the virus particles entering these fluids undergo hydrolysis initially. The initial concentration of monophosphoric acid is reduced towards zero and is subsequently renewed from the digestive system. As the concentration of monophosphoric acid in the intercellular and blood fluids acid is renewed further reduction in the virus concentration takes place in these fluids to the extent that all the viruses can be removed. Remaining intact virus particles commence to multiply.

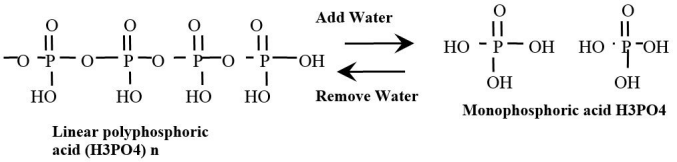

Figure 1: *The hydration-dehydration characteristics of monophosphoric and polyphosphoric acids.*

Virus particle multiplication

Continued production of cell product, such as proteins and DNA or RNA plus any virus particles involve polyphosphoric acid formed by conversion of monophosphoric acid by loss of water from the cells by osmosis (Robertson, 2004). For example, the sum of positive charge minus negative charge between intracellular and intercellular fluids are 0.058 Mol/L for the former and 0.182 Mol/L for the latter (Table 1) (Baker and Worthley, 2002; Braun, 2003; Lobo, 2002). These values indicate an osmotic water flow directed out of the cell which results in continuous formation of the polyphosphoric acid by loss of water from monophosphoric acid. The mechanism of formation of nucleic acid bases involved in the formation of the genome of a given virus particle involve precursor biocompounds derived from urea shown in Table 2 (Robertson, 2004). The precursors of DNA and RNA present in the intracellular fluid cannot enter the interior of virus particles present in the cell in the intracellular fluid due to the presence of the protein or protein/lipid capsid. Under these circumstances virus particle multiplication is initiated at starting points are present on the surface at the ends of cylindrical virus particles and at the poles of spherical virus particles (Robertson, 2011). These points comprise nucleic acid bases or short lengths of DNA/RNA strands. Close to these points are the

Table 1: *Ions in blood, intercellular and intracellular fluid.*

Blood serum	Mol/litre
Na+	0.136-0.145
K+	0.0035-0.005
Mg++	0.00082-0.00123
Ca++	0.022-0.026
Cl-	0.098-0.106
HCO3--	0.027
PO4---	0.0021-0.0046
Intercellular fluid	
K+	0.004
Na+	0.14
Mg++	0.004
Ca++	0.01
Cl-	0.105
HCO3-	0.05
PO4---	0.006
SO4--	0.002
Intracellular fluid	
K+	0.15
Na+	0.01
Mg++	0.05
Ca++	0.006
Cl-	0.002
HCO3-	0.008
PO4---	0.285
SO4--	0.05

*Data from references (*Baker and Worthley, 2002*;* Braun, 2003*;* Lobo 2002*)*

terminating amino acid or amino acids of the protein capsid and any terminating relevant lipid molecules. The DNA or RNA commence to extend from these points in the form of a strand or strands which are simultaneously coated by linking of amino acids forming a new virus particle. The amino acid sequence is charge compatible with the forming charged DNA or RNA molecules. Both cylindrical and spherical virus particles can give rise to at least two new virus particles simultaneously one from each end or pole allowing rapid accumulation of new virus particles in the cell intracellular fluid. In the case of a cylindrical virus particle the single extension or group of extensions coil together producing a cylindrical spring form under the influence of the charge associated with the molecules involved. In the case of a spherical virus particle the extension process is the same and commences at the poles of the sphere with the difference that a group of extensions is normal. In this instance as the extensions form accumulated repulsive charge within the forming strand volume causes the latter to bulge into a spherical shape. The same charge can force components of the capsid protein layer to be extruded in the form of protrusions from the formed spherical surface producing coronavirus particles. The accumulation of electric charge along the extending lengths of DNA, RNA and protein capsid progressively results in the development of an increased charge at the initiation point of the extension. Repulsion effects of the charge build-up at this point causes the new virus particle or particles to break free. At this stage virus extension does not result in the protein capsid, DNA or RNA and any other component which is part of the forming virus particle being degraded by monophosphoric acid as the dominant acid in the intracellular fluid during extension is polyphosphoric acid. The progressive increase in the intracellular monophosphoric acid, formed from polyphosphoric acid involved in DNA/RNA and protein production, reduces the rate of virus particle multiplication.

Variation of genome sequences

In the intracellular fluid of human body cells, the formation of DNA and/or RNA takes place by dehydration reactions involving the various molecular forms of polyphosphoric acid and precursor compounds which are derivatives of urea (Robertson, 2004). The latter compound is formed from the ammonia derived from hydroxylamine which is produced in the intracellular fluid by the Raschig reaction (Robertson, 2004). The rate of formation and amount of a given precursor compound produced during a particular period is controlled by the rate of supply of sulphite and nitrite ions, derived from sulphate and nitrate ions to the cell from dietary sources. The latter amounts are essentially constant in the cells of a given individual human body and different between human bodies. This results in the nucleic acid base sequence in the cells of any individual human being entirely unique and precisely reproducible. For example, the Table 2 shows that methanal hydrate and aminoaldehyde are precursors needed to form all four bases and hence the concentration of these in the intracellular fluid does not favour the formation of any base for inclusion into a given DNA strand. Iso-urea favours the formation of adenine (A), guanine (G) and cytosine (C), isocarbamic acid favours the formation of guanine (G) and thymine (T) and

Table 2: *The precursors involved in the formation of DNA and RNA.*

Adenine	Thymine	Guanine	Cytosine
Two methanal hydrate	One methanal hydrate	One methanal hydrate	Two methanal hydrate
One aminoaldehyde	One aminoaldehyde	One aminoaldehyde	One aminoaldehyde
hydrate	One carbamic acid	Two iso-carbamic acid	One iso-urea
Two iso-urea	One ethanal hydrate	One isourea	

*Data from: Reference (*Robertson, 2011*).*

ethanal hydrate favours the formation of thymine (T). Presupposing that the concentration of adenine in a particular intracellular fluid is highest in the cell type involved, with guanine next in concentration value and with cytosine and thymine present in much lower concentrations, the formed sequence could be ATGCCGATAT and so on. This activity reduces the concentrations of precursors available.

As the precursor concentrations are reduced by formation of DNA/RNA strands the base sequence in the genome changes in accord with the changed precursor concentrations. When the concentrations recover by further supply of Raschig reaction compounds the initial sequence is reformed.

The formation and addition of a particular base of DNA or RNA to an extending strand of a virus particle, such that the sequence is identical to any strands present in the initial virus particle, is under the control of the concentration of a given precursor available at the position and time of addition in the intercellular fluid and the particular cell into which the virus particle has transferred. The components required to form cell compounds and also virus particles are distributed in the intercellular fluid. Cell intracellular fluid is a partially structured hydrophilic colloidal liquid and movement occurs in such a fluid by thermal and concentration gradients (Huke *et al*., 2007). The former originates from biochemical reactions within the intracellular fluid and is directed towards the membrane from the cell centre and the latter originates from dissolving of the inner membrane surface and is directed from membrane to cell centre (Robertson, 2020). The same components and are subject to positional change linked to variations in reaction temperatures and dissolving rates. The effect of this is that positioning of the precursor compounds of DNA and RNA in the intracellular fluid for addition to a virus particle DNA/RNA strand can alter. This gives rise to a variation in the genome sequence which constitutes a mutation. Different versions of a virus which interact with a particular set of body cells, such as the A, B and C versions of the lung cell influenza virus in humans, also arise from differences in component distributions of the same required components in intracellular fluids between individuals. This process constitutes reassortment. The combination of cell division and virus particle reproduction causes a reduction of the concentration of cell nucleic acid precursors at higher rate than normal. This rate cannot be increased without an increase in water loss from the cell. The latter is fixed by the osmotic affect. The result is a reduction or ceasing of cell division and production of other cell products leading to cell failure. This characteristic is identified with virulence.

Formation of a new type of virus particle

The observation that vaccinia virus particle originally from female domestic cattle can enter human cells demonstrates that foreign animal virus particles can enter human cells and supports the proposal that an entire non-human related virus particle enters cells by having compatible membrane characteristics, such as surface molecular structure and surface electrical display. Although virus particles from non-human sources entering a human cell all display acceptable membrane matching characteristics these particles do not the necessarily possess the same volume form, the same DNA or RNA base sequence or the same number of extension points as any known human virus particle which also enters the same cells. In the relevant cells of the human body these non-human virus particles enter an environment in which the concentration and supply of the required replication biocompounds is limited or even unfavourable for complete formation of a virus particle of the non-human type as described. The effect of this is that the formation of a complete individual virus particle of the non-human type in the human intracellular fluid is not normally possible. However, the extension mechanism of multiplication allows for the formation of a new virus particle which is a combination of partially formed versions of the human and animal virus particles. This involves extensions commencing

at one end of both types of virus particles with these extensions advancing towards one another through the intracellular fluid. The intermingling is followed by the entire group of DNA/RNA extensions being enclosed in a mixed charge compatible protein capsid which formed simultaneously. The free ends extend normally releasing reproductions of the origin two virus particles unchanged as described. The dual product is a new virus particle. This is new type of virus particle whose formation is possible on the grounds that each part does not require that entire available concentration of any specific intracellular biocompound. The new particle can exhibit a change in volume form while retaining a sufficiency of capsid charge and morphology characteristics to allow entry into the same cells in the different human metabolisms as the original virus particles.

By the nature of the process described this combination is rare. Such a virus possesses the characteristic of causing the same deleterious condition, e.g., influenza, in the human body and the body of the non-human contributor. For example, a new virus particle generated by the interaction of human and swine specific virus particles, each causing an influenza reaction in the separate hosts, produces a virus particle capable of inducing the condition of influenza in both humans and swine simultaneously. The conditions required for the formation of a new virus particle to occur is that a human experiencing human influenza is closely associated for a extended period with, for example, an avian group such as poultry, in which members of the latter group are experiencing avian influenza. Transfer of the virus particles involved occurs as an aerosol or manipulation. In due course the new type of virus particles enters eggs produced by the avian species. Fertilised poultry eggs are widely used as generating enclosures and medium for virus particle multiplication. In most metabolisms the forming offspring is protected from entry of deleterious bacteria and virus particles. However, this situation is not absolute, and some such bodies do enter the metabolism of a forming offspring from the maternal source, for example human immunodeficiency virus particles (HIV). In the egg enclosure the process of multiplication of the new virus particle as described above takes place. The new virus particle will decrease the content of DNA/RNA base forming particles alone. In both humans and the avian species involved this activity increases the rate of reduction of cell functions (increased virulence) and will be evident in subjects with a reduced to the rate of nucleic base production such as occurs in humans with increasing age.

The observation of different versions of the same virus the particles causing the same debilitating effects in the same cell type means that to prevent a common cold, for example, an individual has ideally to be vaccinated with attenuated versions of the virus particles produced by his or her own cells. The change in virus particle characteristics caused by repeated culture is a measure of intracellular component positional variations in sequenced cultures. Virus particles multiplying by extension in a cell in which the rate of reformation of polyphosphoric acid is slow, due to variation of the digestive function, can remain in the cell for an extended period slowly multiplying. Under these conditions the virus appears to become dormant. This effect is seen in the decrease in the rate of formation observed for HIV particles shortly after entry in human cells. The effect also is the case for the appearance of the condition of shingles long after infection by the varicella-zoster virus. This change occurs when intracellular concentration of polyphosphoric acid in the relevant cells housing the dormant virus is increased by change in the supply in the metabolic fluids. The vaccinia virus prevents entry or limits the number of smallpox virus particles that enter the relevant cells and functions by depriving the latter virus particles of biocompounds (DNA, RNA or proteins) required to multiply. This indicates a sufficiency of the necessary biocompounds to form vaccinia but not a sufficiency to form both virus particles simultaneously as described above.

Conclusions and Recommendations

It is concluded that recently identified respiratory virus particles such as SARS, Mers and SARS-CoV-2 (causative agent of COVID-19) and Spanish influenza are novel virus particles produced as described. The first three virus particles are proposed as being new virus particles formed from the combination of human respiratory virus particles and avian respiratory virus particles while the fourth involved swine influenza virus particles. The concentration (repository) available and released in a given period is related to the cycle of breeding of the animal, the number involved, and the land area concentration involved. In the case of a human-avian novel virus the repository will be at a maximum in the eggs of

birds hatched from birds born in the early part of the year, for example March and eggs from these birds produced in November of the same year where the contents were exposed by breakage and not neutralised by cooking or alternative treatment. All farmed avian species (poultry, geese, turkey and ducks) are potential sources of the evolution of the human-avian virus particles. The avian species identified as the most likely source is farmed poultry permanently enclosed in extensive specifically designed buildings. Geese, turkeys and ducks are generally produced under free range conditions and are thereby less likely to meet the conditions for production of the human=avian virus particle.

In addition to the use of a vaccine to control the new virus particles, formed as described, all of these virus particles can be controlled eliminating direct and close interaction of human and non-human projectors and/or by culling to a degree the animal species involved. The 1918-1920 outbreak of swine influenza ceased as a result of the removal of infected animals to the food supply and the abnormal excessive death of individual male humans in the European conflict. At present it is considered that the sole manner in which additional virus particles are produced in a given human population is by infected humans. The mechanism of formation of novel virus particles described indicates that both the human and non-human sources are a source of increase in virus particles.

This is supported by the recent reported observation that the CoVid -19 virus pandemic has caused the rates of human influenza to fall sharply (Jones, 2020). Although this can be interpreted as being the result of the effects introduced to limit public movement the effect can also arise as the result of the combination of normal annual human influenza and avian (poultry) influenza as described above producing the Covid-19 virus particle.

From the proposals described virus particles entering the human metabolism the are controlled naturally by hydrolysis of the protein capsid. This effect occurs to some extent within the cell involved but mainly in the blood. In the latter fluid the hydrolysis compound is free monophosphoric acid (H3PO4) or this acid enclosed in mucus. Control of virus particles in the metabolism is possible by direct injection of this acid or enclosed in a spray composed of human mucus. The acid concentration used is defined as a blood phosphate concentration of 1.46 mmol/L with an upper limit of 4.54 mmol/L (Merck Manuals, 2018). The latter value is defined as the concentration linked to hyperphosphatemia. Intake of the acid through the digestive system is unlikely to be effective as monophosphoric acid is identified as the digestive protein hydrating agent active in this metabolic unit and is converted to polyphosphoric acid by the process.

Novelty Statement

As far as is known the mechanisms and chemical reactions applied in the work presented are entirely novel.

Conflict of interest

The authors have declared no conflict of interest.

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