Vaccination In Adults

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Abstract

Vaccines play a special role in the health & security of nations. Considerable controversy exists regarding adult vaccination /immunizartion especially in developing countries like India. There is lack of consensus regarding the optimal strategy for adult immunization. Therefore this issue is taken for discussion.

Introduction:

Vaccines play a special role in the health & security of nations[1]. They are very useful as preventive medicine in public health to reduce morbidity & mortality due to communicable diseases, though they are not a substitute to safe drinking water, sanitation, nutrition & environmental health in the long run[2].

Definition of Vaccination[1] :

The term vaccination & immunization are often used interchangeably although technically the former denotes the administration of vaccine where as latter refer to the induction or provision of immunity by any means active/passive .Thus vaccination does not guarantee immunization & immunization may not involve vaccine.

Considerable controversy exists regarding adult vaccination /immunizartion especially in developing countries such as India. Even among published guidelines from international organization & other professional associations from the developed countries ,there is lack of consensus regarding the optimal strategy for adult immunization. On the other hand paediatric immunization programme have been one of the most successful public health interventions in India also[3]. There fore this issue is taken for discussion.

Why might some adults need vaccine[4]?

Some adults incorrectly assume that the vaccines they receive as children will protect them for the rest of their lives. Generally this is true, except that

- Some adults were never vaccinated as children.
- Newer vaccines were not available when some adults were children.
- Immunity can begin to fade over time.
- As we age ,we become more susceptible to serious disease caused by common infections (eg. Flu, Pneumococcus).
- Adults older than 20yrs of age are also at a risk of deaths due to various other infectious diseases like tetanus, Diphtheria, Measles, Mumps & Rubella.

Scenario in India[3]:

Reliable epidemiological data regarding the burden of infectious diseases (also for noninfectious diseases) from India were lacking previously. There is also sparse published data are available from India regarding the efficacy & safety of various adult immunization strategies (REF)

Description of Preventive measures:

Adult immunization are administered in primary series, booster doses & periodic doses. This policy statement does not discuss either immune globulins for passive

prophylaxis or recommendations for adults with special risks such as immunodeficiency, other medical conditions, travel & occupation[5].

Various adult immunization schedule: (see table no.1-5)

Recommended Adult immunization schedule United states 2010 [6,7,8]:

The advisory committee on immunization practices (AICP) annually reviews the recommended Adult immunization schedule (see Table 3) to ensure that the schedule reflects current recommendations for the licensed vaccines. In October 2009 AICP approved the adult immunization schedule for 2010.which includes several changes. They are as follows.

1.Bivalent HPV vaccine (HPV2) has been licensed for use in females. Either HPV2 or HPV4can be used for vaccination of females aged 19yrs through 26yrs & permissive recommendation for use of HPV4 in males

2.Adults born during or after 1957 do not need one or more doses of MMR for the measles & mumps components. Second dose of MMR should be administered 4wks after first dose.

3.Women who do not have documentation of rubella vaccination should receive a dose of MMR.

4.Recommendations for vaccinating health care personal born before 1957 routinely & during outbreak.

5.Seasonel & pandemic influenza should be distinguished.

6.Indication for hepatitis A vaccine is for unvaccinated persons who anticipate close contact with international adoptee.

7.Hepatitis B has been revised to include an information for the 3 dose hepatitis B vaccine.

8.The meningococcal vaccine:conjugate vaccine (MCV4) is preferred for adults aged 55yrs or younger & that of the meningococcal polysaccharide vaccine(MPSV4) is preferred for adults aged 56 yrs or older. Revised MCV4 is recommended for adults previously vaccinated with MCV4 or MPSV4 or who is at increased risk is provide.

Report on evidence based clinical guide lines by expert group on adult immunization in India[3]:

To address the issue an expert group meeting for evolving consensus Recommendations on Adult immunizationin India was jointly organized by the Association of physicians of India & the department of Medicine, All India Institute of Medical Sciences(AIIMS)New Delhi at the AIIMS on December 6th june2008.Depending on available data, the different levels of evidence & recommendations cited in these adult immunization guidelines have been given. However it needs to be appreciated that each vaccine has it's own specific considerations which may need to be addressed individually by the clinician.

Cholera: vaccine available in injectable killed whole cell ,but poor efficacy (45%) & protection only 3 months. Doses recommended are 2 one week to one month apart. Currently available oral cholera vaccines are not recommended for routine adult immunization & for outbreak control.[9.10]

Diphtheria, Pertusis & Tetanus(DPT/Tdap)[11]: Recommended for all adults not immunized earlier. The recommended immunization schedule for adults following trauma. (See Table 6).

The pregnant women should receive one dose of Tdap if they have not received it previously. Those who have received the Td vaccination more than 10yrs ago should receive one dose of Td vaccine in second & third trimester of pregnancy. Pregnant women who have received the vaccination during the preceding 10yrs should receive one dose of Tdap in immediate postpartum period. Who have never received previous vaccination three

doses of Td vaccine are indicated in second & third trimester of pregnancy. (two doses atleast 4 weeks apart & third dose is given 6-12 months after the second).

Hepatitis A vaccine[12,13]: Universal immunization for hepatitis A is not recommended yet.

(See Table7)

Hepatitis B vaccine[14]: It is indicated for all unvaccinated adults at risk for HBV infection & all adults seeking protection from HBV infection including post exposure prophylaxis.

Prevaccination screening may be cost effective in adult populations with a prevalence of HBV infection of >20% (see Fig 1).

In special situation like chronic kidney disease (CKD) & other immuno suppressed patients 40µg of recombinant vaccine is administered at 0,1,2 & 6 months.AntiHBs antibody titer must be measured every 2-3 months following last dose.

Herpes Zoster vaccine : Not recommended presently for use in adult population with or without comorbid conditions.[15]

HPV vaccine[16]: Humam papilloma virus vaccines for prevention of cervical cancer are commercially available. These include Gardasil (Merk, USA) a quadrivalent vaccine containing the HPV virusL1 protein like particles of HPV6,11,16 &18;Cervirax (Glaxo SmithKline, Belgium) is a bivalent vaccine containing L1 VLPs of HPV 16,18.The vaccines has to be delivered prior to exposure to HPV virus. Therefore, the immunization must precede the sexual debut. Age for initiation for vaccination is 10-12yrs.catch up vaccination can be advised up to age of 26yrsfor Gardasil vaccine & 45yrs for Cervarix vaccine. HPV vaccine can be given simultaneously with other vaccine (Hepatitis B.Tdap) It is contraindicated in pregnancy but not in lactation. Recommendations are similar to adult immunization schedule 2010.(See Table3).

Influenza vaccine[3]: In the absence of epidemiological surveillance regarding influenza serotypes in our country the expert group observes that presently the use of influenza vaccine in India is not recommended. Even with comorbid conditions like cardiac or pulmonary diseases, diabetes mellitus, cancer, renal disease hemoglobinopathies & immunodeficiency in adults.

Japanese encephalitis vaccine[17]: It is not recommended for routine use in adults.

MMR vaccine[3]: All adults (except those who have medically documented history of having all three disease, those who have received two doses of MMR vaccine in childhood & those with any contraindications for receiving this vaccine) should receive one dose of MMR vaccine.

Meningococcal vaccine[18]: Routine vaccination for all adults not recommended. Vaccine can be used in selected population like I) during outbreak ii) inter epidemic period iii) travelers, pilgrims people attending fairs & festivals.

As national policy, the National Institute of Communicable Diseases (NICD), Delhi is administering quadrivalent polysaccharide vaccine to Haj pilgrims to fulfill the requirements of Government of saudi Arabia[3].

Pneumococcal vaccines(PPV)[19,20]: Available evidence is insufficient to recommend routine use of PPV in adults. It is recommended in patients undergoing splenectomy (preferably at least 2 weeks prior to splenectomy) & one time revaccination is indicated after 5yrs.

Latest published meta analysis commissioned by the WHO concluded that "Pneumococcal vaccination does not appear to be effective in preventing pneumonia, even in populations for whom the vaccine is currently

recoommended"

Rabies vaccine[3]: Depending on category of wound (see Table 8&9).

Salmonella Vaccine[21]: Typhoid is recommended as part of routine immunization. Either Ty21a or Vi vaccine may be used as both have comparable efficacy.(51%Vs55% at 3yrs).

Varicella vaccine[22]: Persons aged over 13yrs without evidence of varicella immunity should receive 2 doses of vaccine 4-8weeks apart.

Use of vaccines in special circumstances[1]:

1. Breast feeding: Neither killed nor live vaccines affect the safety of breast feeding for either mother or infant.

2.Occupational exposure: Immunization recommendations for most of occupational groups remain to be developed.

3.HIV infection & other Medical conditions: Persons known to be infected with HIV should be immunized with recommended vaccine in the same manner as individuals with a normal immune system & as early in the course of their disease as possible, before immune functions become significantly impaired.

4.Travel: All adults should have all routine immunizations updated before traveling especially to developing countries. (hepatitis A, Typhoid, Yellow fever, Japanese B encephalitis, MMR)

Current controversies[1]: Even though vaccines are very safe & serious adverse events proven to be due to licensed vaccines are rare, the recent rise in the reporting of autism spectrum disorders has led some parents of affected children to claim that thimerosal used as a preservative is cause of the problem. This is not applicable to adults.

Simultaneous administration of multiple vaccines[1]: The simultaneous administration of vaccines is useful in any age group when potential risk exists for exposure to multiple infectious diseases during travel to endemic countries.

Handling of Vaccines[1]: Vaccines should be kept at 2^0-8^0C & with exception of varicella vaccine & live attenuated influenza vaccine should not be frozen. The latter two vaccines should be frozen at -15^0C. Measles vaccine must be protected from light which inactivates the virus.

Newer vaccines :

Preventive HIV vaccine: Previously Two phase III trials taken in the united states & Thiland using soluble gp120 but failed to protect human volunteers from HIV infection.[1,23]

Recently a large Thai phase III HIV vaccine clinical trial also known as RV 144 took place in Thailand. Total 16402 non infected volunteers(18-30yrs) having average risk of HIV infection were enrolled for the study. It was placebo controlled study. Half of the subjects received six doses of vaccine combo made from the virus that commonly circulates in Southeast Asia. Results of the study declared in September 2009 showed that vaccines used were safe & yielded at 31% efficacy for the prevention of the HIV infection which was statistically significant even though the difference was marginal.[24] In India National AIIDS research Institute (NARI) Pune & ICMR are involved in phase I HIV vaccine trial[25],[26].These clinical trials for phase I of the HIV. AIDS being developed in India entered final stage in Aug 2008.Tuberculosis Research Centre(TRC) Chennai & NARI Pune gave the last round of shots to 32 candidates enrolled in the trials. Final results awaited[27],[28]. 30 candidates are undergoing HIV vaccine trials in19 countries .India has two vaccines approved for phase I human trials ,the Adeno-Associated virus vaccine & modified vaccine Ankara vaccine. Inspite of multiple trials conducted on HIV prevention, till date not single result is

available suggesting complete protection from HIV/AIDS.

Malaria Vaccine: Results of PhaseI trial in children of Mali, West Africa revealed new Malaria vaccine safe & protective in children[29]China developed Malaria vaccine is under trial in Shanghai .70 healthy volunteers will receive vaccine named PFCP2.Chetan Chitnis Nagpur, from international centre for genetic Engineering & Biotechnology (ICGEB) at Delhi along with his team are trying hard to make the malaria vaccine reache the phase I trial.

Mosquirix (malaria vaccine). RTS, S, uses recombinant protein that fuses a part of the P. Falciparum circum sporozoites protein with hepatitis B surface antigen) has been tested for 17yrs for it's safety & effectiveness the first potential malaria vaccine to reach the phase III trial stage.

This advanced trial of a new mosquito medicine that began in Africa could lead to world's first malaria vaccine becoming available as soon as 2011. Glaxo Smithkline (GSK) phase III trial of it's mosquirix injecting 1200 infants & children in the town of Bagamoyo in Tanzania. 16000 patients will be immunized in seven African countries including Mozambigue, Kenya & Malavi[30]

Swine Flue: Swine Flu vaccination programme began on 20th Octo 2009 & highest risk groups were offered vaccine.Dosage vaccination schedule recommended in UK.

Pandemic: children 6months & <10yrs –single dose 0.25ml.

Immunocompromised children aged > 6months & <10yrs – 2 doses .25ml atleast 3wks apart.

Healthy children -0.5ml.

Safe in pregnancy(ref)

Recently nasal sine flu vaccine(Nasovac) for >3yr age group produced by serum institute of India is now in market. Vaccine is in powder form.[31,32]

Chikungunya & dengue Vaccine: Limited data available.trials in progress.[33]

Cancer vaccines:

HPV vaccine : For prevention of cervical cancer.[16] (refer above)

Vaccines for breast cancer, skin & soft tissue cancers, Prostate cancer & liver cancer are in progress. Results of the human Trials are still awaited [34,35,36]

Conclusion: Vaccines offer the opportunity to control & even eliminate some diseases through individual & herd protection. Vaccines also represent the best societal hope for stopping the pandemic of HIV infection throughout the world & for efficiently controlling Malaria & Tuberculosis. Issues of cost liability, risk & profitability limit the interest of the pharmaceutical industry in the development of vaccines for infectious diseases of the poor. Till that time "PREVENTION" will be the watch word.

Table 1:

Recommended Adult Immunization Schedule
United States, October 2006–September 2007

Recommended adult immunization schedule, by vaccine and age group

Vaccine ▼ / Age group (yrs) ▶	19–49 years	50–64 years	≥65 years
Tetanus, diphtheria, pertussis (Td/Tdap)[1*]	1-dose Td booster every 10 yrs; Substitute 1 dose of Tdap for Td		
Human papillomavirus (HPV)[2*]	3 doses (females)		
Measles, mumps, rubella (MMR)[3*]	1 or 2 doses	1 dose	
Varicella[4*]	2 doses (0, 4–8 wks)	2 doses (0, 4–8 wks)	
Influenza[5*]	1 dose annually	1 dose annually	
Pneumococcal (polysaccharide)[6,7]	1–2 doses		1 dose
Hepatitis A[8*]	2 doses (0, 6–12 mos, or 0, 6–18 mos)		
Hepatitis B[9*]	3 doses (0, 1–2, 4–6 mos)		
Meningococcal[10]	1 or more doses		

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection)

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine*, 17th Edition: http://www.accessmedicine.com

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Table 2: Recommended Postexpoure Immunization with immunoglobulin in the United states

Disease	Indicated	Comments
Measles immuno	Yes	Recommended dose 0.25-0.50ml/kg(40-80IgG/kg)IM for compromise contacts max 15ml
Rubella	No	Efficacy unreliable. Recommended for only to antibody negative pregnant women in1st trimester who have documented rubella exposure& will not consider terminating the pregnancy 0.55ml/kg(90g IgG /kg)IM
Tetanus	Yes	250-500units of TIG (10-20mg of IgG/kg)IM Dose for treatment is 3000-6000 units of TIG IM
Rabies	Yes	Recommended RIG for non immunized individuals with animal bites in whom rabies cannot be ruled out & with other exposures to known rabid animals. Dose 20IU/kg(22mg gG/Kg)IM Recommended dose of antiserum is 40IU/kg 0,3,7,14 &28days
Hepatitis A	Yes	Post exposure treatment with Hepatitis A immunoglobulin has not been studied
Varicella	Yes	Vari ZIG a new candian purified human immunoglobulin not currently licensed in US

Table 3: Recommended Adult Immunization Schedule by Vaccine and Age Group — United States, 2010

Vaccine	19-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years
Tetanus, diphtheria, pertussis (Td/Tdap)[1, *]	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs				Td booster every 10 yrs
Human papillomavirus (HPV)[2, *]	3 doses (females)				
Varicella[3, *]	2 doses				
Zoster[4]				1 dose	
Measles, mumps, rubella (MMR)[5, *]	1 or 2 doses		1 dose		
Influenza[6, *]			1 dose annually		
Pneumococcal (polysaccharide)[7, 8]	1 or 2 doses				1 dose
Hepatitis A[9, *]	2 doses				
Hepatitis B[10, *]	3 doses				
Meningococcal[11, *]	1 or more doses				

[*] Covered by the Vaccine Injury Compensation Program.

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection)

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

No recommendation

Table 4: Vaccines That Might Be Indicated for Adults Based on Medical and Other Indications -- United States, 2010

Vaccine	Pregnancy	Immunocompromising conditions (excluding human immunodeficiency virus [HIV])[13]	HIV infection[3, 12, 13] CD4 + T lymphocyte count		Diabetes, heart disease, chronic lung disease, chronic alcoholism	Asplenia[12] (including elective splenectomy and terminal complement component deficiencies)	Chronic liver disease	Kidney failure, end-stage renal disease, recipients of hemodialysis	Health care personnel
			<200 cells/µL	≥200 cells/µL					
Tetanus, diphtheria, pertussis (Td/Tdap)[1, *]	Td	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs							
Human papilloma virus (HPV)[2, *]		3 doses for females through age 26 yrs							
Varicella[3, *]	Contraindicated		2 doses						
Zoster[4]	Contraindicated			1 dose					
Measles, mumps, rubella (MMR)[5, *]	Contraindicated		1 or 2 doses						
Influenza[6, *]	1 dose TIV annually								1 dose TIV or LAIV annually
Pneumococcal (polysaccharide)[7, 8]		1 or 2 doses							

Pneumococcal (polysaccharide)[7, 8]	1 or 2 doses
Hepatitis A[9, *]	2 doses
Hepatitis B[10, *]	3 doses
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For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection)

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

No recommendation

Table5: Special Vaccines for Infants, Children & Adults

vaccine	Vaccine type	Routes of Administration	Indication	Efficacy	Adverse reaction
Anthrax	Inactivated avirulent bacteria	Sc 6 doses.Primary plus annual booster	High risk of exposure involved in manufacture of animal hides, furs,bone meal, wool.goat hair. Biowarfare exposure.	Uncertain	Not known
Tuberculosis (BCG)	Live bacteria	Intra dermal	Not recommended in US	Variable for Adult PTB. Best for children for prevention	Regional adenitis.disseminated infection in immunocompromised host.
Cholera	Killed whole bacteria	oral	Travelers to endemic areas. Not for US citizen	60-85%. Short duration	Fever,& local reaction,pain,swelling
Plague	Inactivated bacteria	IM	Lab workers,foresters in endemic areas	uncertain	10% local reaction
Rabies	Inactivated virus. Human diploid cell or purified chick embryo.	IM/ID	For Travelers to high risk countries ,lab workers, veterinarians.or post exposure suspected rabies infected animal	Virtually 100%	Local reaction, arthropathy, adenopathy,angioedema
Yellow fever	Live attenuated virus	Sc	Travelers to endemic areas,lab workers	high	Neurologic complications,Respiratory,renal & hepatic failure. Lymphocytopenia ,thrombocytopenia.
Japanese B encephalitis	Inactivated virus	Sc	Travelers to endemic area	80-90%	Anaphylaxis.delayed allergic reaction. Observe for 10 days
Typhoid	Purified Vi polysaccharide Oral live attenuated Ty21 a strain	IM Oral	Travelers to high risk area southern Asia All >6yrs except with in 24hrsantibiotic ingestion or febrile patient	50-80%	Nil

Table 6:Tetanus immunization schedule for adults with injury /Trauma

History of tetanus toxoid doses	Clean minor wound	All other wounds
Unknown or less than three doses	Tdap/ Td	Tdap/Td, TIG
Three or more doses	Tdap/Td if more than 10yrs have elapsed since last tetanus toxoid dose	Tdap/ Tdif more than 5yrs have elapsed since the last tetanus toxoid dose

Table7:Vaccination Schedule For Hepatitis A

Age(yrs)	Vaccine	Dose	Vol / dose(ml)	Route of inj	No.of doses	Schedule(months)
1-18	Vaqta (Merk)	25U	0.5	IM	2	0,6-18
	Havrix (GlaxoSmithline)	720EL U	0.5	IM	2	0,6-12
≥19	Vaqta (Merk)	50U	1IM	IM	2	0,6-18
	Havrix (GlaxoSmithline)	1440EL U	1	IM	2	0,6-12
	Twinvix (Glaxo Smithline)	720EL U (hepatitis A) 20µg (hepatitis B)	1	IM	2	0,1,6

EL U =enzyme linked immunosorbent assay units.

Fig 1: Expert Group-recommended prescreening protocol for hepatitis B virus infection.

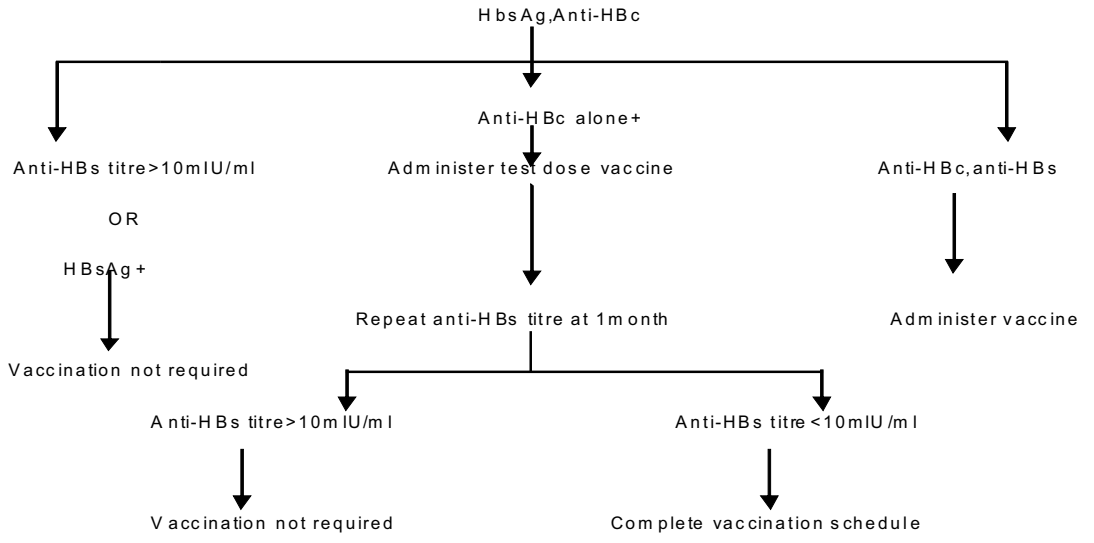

Table 8 :Rabies vaccine Regimens for Prophylaxis

Route	Regimen	Dose	Schedule (days)
Intradermal	Two-site	0.1ml	0,3,7.28
Intradermal	Eight site	0.1ml	Day 0 (8 doses) 7(4does) 28,90

Two site regimen signifies right & left upper arm (total 2 sites)
On each day,one injection is administered in right & left upper arm.
Eight site regimen signifies both upper arms,both lateral thigh, both suprascapular
Regions & both sides of the lower quadrant region of the abdomen(total 8 sites)
One injection each in both upper arm,both internal thigh,both suprascapular
Region & on both sides of the lower quadrant region of the abdomen(total 8 doses)
One injection each in both upper arm & both lateral thigh (total 4 doses)
One dose in one upper arm only.

Table 9: Definition of Categories of exposure & use of rabies biologicals

Category		Type of wound	Recommendation
III		Single or multiple transdermal bites,scratches or contamination of mucous membrane with saliva (ie.licks) exposure to bats	Wound management plus rabies immunoglobulin plus vaccination
II		Minorscraches or abrasions without bleeding or licks on broken skin & nibbling of uncovered skin	Wound management plus use vaccine alone
I		Touching,feeding of animals or licks on intact skin.No exposurehas occurred	No prophylaxis

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