

## PRODUCT MONOGRAPH

<sup>D</sup>INFLUVAC<sup>®</sup>  
influenza vaccine, surface antigen, inactivated

Suspension for Injection

Each 0.5 mL pre-filled syringe contains neuraminidase and 15 mcg hemagglutinin of each virus strain as recommended by the WHO and NACI.

Active Immunizing Agent for the Prevention of Influenza  
ATC Code: J07BB02

BGP Pharma.ULC  
85 Advance Road  
Etobicoke, Ontario  
M8Z 2S6

Date of Preparation:  
July 15, 2005

Date of Previous Revision:  
May 5, 2015

Date of Revision:  
January 8, 2016

<sup>®</sup>Registered Trademark Abbott Biologicals B.V., licensed use by BGP Pharma.ULC, Etobicoke, Ontario, M8Z 2S6

Submission Control No: 184402

Date of Approval: May 25, 2015

## Table of Contents

<b>PART I: HEALTH PROFESSIONAL INFORMATION.....</b>	<b>3</b>
SUMMARY PRODUCT INFORMATION .....	3
DESCRIPTION.....	3
INDICATIONS AND CLINICAL USE.....	3
CONTRAINDICATIONS .....	6
WARNINGS AND PRECAUTIONS.....	6
ADVERSE REACTIONS.....	9
DRUG INTERACTIONS .....	15
DOSAGE AND ADMINISTRATION.....	15
OVERDOSAGE .....	16
ACTION AND CLINICAL PHARMACOLOGY .....	17
STORAGE AND STABILITY.....	18
SPECIAL HANDLING INSTRUCTIONS .....	18
DOSAGE FORMS, COMPOSITION AND PACKAGING .....	19
<b>PART II: SCIENTIFIC INFORMATION .....</b>	<b>20</b>
PHARMACEUTICAL INFORMATION.....	20
CLINICAL TRIALS.....	21
DETAILED PHARMACOLOGY .....	35
MICROBIOLOGY .....	35
TOXICOLOGY .....	35
REFERENCES .....	36
<b>PART III: CONSUMER INFORMATION.....</b>	<b>38</b>

# <sup>D</sup>INFLUVAC<sup>®</sup>

influenza vaccine, surface antigen, inactivated

## PART I: HEALTH PROFESSIONAL INFORMATION

### SUMMARY PRODUCT INFORMATION

<b>Route of Administration</b>	<b>Dosage Form / Strength</b>	<b>Clinically Relevant Nonmedicinal Ingredients</b>
Intramuscular injection or deep subcutaneous injection	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per virus strain in a suspension	INFLUVAC may contain traces of eggs (such as ovalbumin, chicken proteins), formaldehyde, cetyltrimethylammonium bromide, polysorbate 80, or gentamicin, which are used during the manufacturing process. <i>For a complete listing see <b>DOSAGE FORMS, COMPOSITION AND PACKAGING SECTION.</b></i>

### DESCRIPTION

INFLUVAC (influenza vaccine, surface antigen, inactivated) is a trivalent subunit influenza vaccine. Each 0.5 mL dose contains neuraminidase and 15 mcg of hemagglutinin antigen for each virus strain present in the vaccine. The composition of INFLUVAC is adapted annually to comply with the World Health Organization (WHO)<sup>2</sup> and the National Advisory Committee on Immunization (NACI)<sup>1</sup> recommendations (northern hemisphere). The virus strains used in the vaccine for 2015/2016 are:

- an A/California/7/2009 (H1N1)pdm09-like virus;
- an A/Switzerland/9715293/2013 (H3N2)-like virus;
- a B/Phuket/3073/2013-like virus..

INFLUVAC is a colourless clear liquid. INFLUVAC is thimerosal-free, mercury-free, and contains no preservative.

### INDICATIONS AND CLINICAL USE

INFLUVAC (influenza vaccine, surface antigen, inactivated) is indicated for the prevention of influenza infection caused by the specific strains contained in the vaccine, in adults of 18-years of age and older.

The National Advisory Committee on Immunization (NACI) recommends annual vaccination for individuals in the following categories:

### **People at High Risk of Influenza-related Complications<sup>1,9</sup>**

- Healthy children aged 6 to 23 months are at increased risk of influenza-associated hospitalization compared with healthy older children and young adults.
- Adults and children<sup>4,5</sup> with chronic cardiac or pulmonary disorders (including bronchopulmonary dysplasia, cystic fibrosis, and asthma) severe enough to require medical follow-up or hospital care.
- People of any age who are residents of nursing homes or chronic care facilities.
- People 65 years of age and over<sup>6,7</sup>.
- Adults and children with chronic conditions such as diabetes mellitus and other metabolic diseases, cancer, immunodeficiency, immunosuppression (due to underlying disease and/or therapy), renal disease, anemia, and hemoglobinopathy. Although some immunosuppressed individuals may have a suboptimal immune response, influenza vaccination is safe and can induce protective antibody levels in a substantial proportion of adults and children, including transplant recipients, those with proliferative diseases of the hematopoietic and lymphatic systems, and HIV-infected patients.
- Children and adolescents (aged 6 months to 18 years) with conditions treated for long periods with acetylsalicylic acid (ASA).
- People at high risk of influenza complications who are embarking on travel to destinations where influenza is likely to be circulating.

### **People capable of transmitting influenza to those at high risk of influenza-related complications<sup>1</sup>:**

People who could transmit influenza to those at high risk should receive annual vaccination, regardless of whether the high-risk person(s) has been immunized:

- Health care providers who work in facilities and community settings, such as physicians, nurses, and emergency response workers.
- Health care and other service providers who have contact with residents of continuing care facilities or residences.
- Those who provide home care for persons in high-risk groups.
- Those who provide services within closed or relatively closed settings to persons at high risk (e.g. crew on ships).
- Household contacts (adults and children) of people at high risk of influenza complications. This includes household contacts of children < 6 months of age, who are at high risk of complications from influenza but for whom there is no currently licensed vaccine, and of children aged 6 to 23 months whether or not they have been immunized.

- Pregnant women should be immunized in their third trimester if they are expected to deliver during influenza season, as they will become household contacts of their newborn (unless adoption occurs).
- Those providing regular child care to children aged 0 to 23 months, whether in or out of the home.
- ***People who provide essential community services<sup>1</sup>***. Vaccination for these individuals should be encouraged in order to minimize the disruption of routine activities in epidemics. Employers and their employees should consider yearly influenza immunization for healthy working adults, as this has been shown to decrease work absenteeism due to respiratory and other illnesses.
- ***People in direct contact with poultry infected with avian influenza during culling operations<sup>1</sup>***. The relevant individuals include those performing the cull as well as others (such as supervising veterinarians and inspectors) who may be directly exposed to the avian virus.

Those persons who would be expected by reason of their employment to come into direct contact with infected poultry during culling operations in the event of potential avian influenza outbreaks should be immunized with TIV on a yearly basis prior to the human influenza season. Those who are immunized with TIV just before exposure to avian influenza will not produce protective antibodies against the human vaccine strains for approximately 10 to 14 days. Antiviral prophylaxis should be used as an adjunct to TIV immunization in order to prevent infection with either avian or human influenza during the culling operation. Advice should be sought from the local medical health officer regarding the use of TIV and influenza antiviral prophylaxis in the control of avian influenza outbreaks. This is a theoretical concern. For further information, please refer to NACI guidelines.

- **Healthy persons aged 2 to 64 years. Individuals in this age group should be encouraged to receive the vaccine, even if they are not in one of the aforementioned priority groups<sup>1</sup>.**
- **Pregnant and breastfeeding women who are characterized by any of the conditions listed under "Recommended Recipients"<sup>1,9</sup>**. This includes pregnant and breastfeeding women who have chronic conditions that put them at high risk of complications from influenza, as well as those who are close contacts of high-risk individuals. (refer to Pregnancy section in Special Populations)

### **Pharmacodynamic properties**

Seroprotection is generally obtained within 2 to 3 weeks. The duration of post-vaccinal immunity to homologous strains or to strains closely related to the vaccine strains varies but is usually 6 to 12 months.

### **Pharmacokinetic properties**

Not applicable.

### **Geriatrics (> 65 years of age):**

Studies on healthy elderly showed that Influvac is well tolerated (For more details, refer to CLINICAL TRIALS section.).

### **Pediatrics (6 months to 4 years of age):**

A clinical trial in high-risk children with chronic respiratory or congenital heart disease aged 6 months to 4 years showed that the vaccine was well tolerated and induced an immunogenic response against all three hemagglutinin antigens.

## **CONTRAINDICATIONS**

The influenza virus for INFLUVAC (influenza vaccine, surface antigen, inactivated) is propagated in chicken eggs; therefore, this vaccine should not be administered to anyone with a history of hypersensitivity (allergy) and especially anaphylactic reactions to eggs or egg products<sup>9</sup>.

Allergic reactions are extremely rare and are usually attributable to extreme sensitivity to certain components of the vaccine, probably to trace amounts of residual egg protein.

INFLUVAC should not be given to people who have a hypersensitivity to the active substances, to any of the excipients or to any component that may be present as traces such as eggs, chicken protein (such as ovalbumin), formaldehyde, cetyltrimethylammonium bromide, polysorbate 80, or gentamicin. For a complete listing, see the **DOSAGE FORMS, COMPOSITION AND PACKAGING** section of the product monograph.

Allergic or anaphylactic reactions to a previous dose of influenza vaccine are contraindications for vaccination.

Immunization with INFLUVAC should be deferred in the presence of any acute illness, including acute or unstable neurologic illness, febrile illness, or active infection<sup>1</sup>.

A minor febrile illness such as mild upper respiratory infection is not usually reason to defer immunization<sup>1</sup>.

## **WARNINGS AND PRECAUTIONS**

### **General**

If INFLUVAC (influenza vaccine, surface antigen, inactivated) is used in persons receiving immunosuppressive therapy, including corticosteroid therapy<sup>1, 10</sup>, the expected immunological response may be diminished. Antibody response in patients with endogenous or iatrogenic immunosuppression<sup>1, 11</sup> may be insufficient.

As with all injectable vaccines, appropriate medical treatment and supervision should always be readily available in case of a rare anaphylactic event following the administration of the vaccine.

INFLUVAC should not be administered into the buttocks due to varying amounts of fatty tissue in this region, nor by the intradermal route, since these methods of administration may induce a weaker response.

INFLUVAC must not be administered intravascularly.

Sterile epinephrine HCl solution (1:1000) and other appropriate agents should be made available for immediate use in case of an anaphylactic reaction or if acute hypersensitivity to the vaccine occurs<sup>9</sup>. Health care providers should be familiar with current recommendations for the initial management of anaphylaxis in non-hospital settings, including proper airway management. Before administration of any vaccine, all appropriate precautions should be taken to prevent adverse reactions. This includes a review of the patient's history with respect to possible hypersensitivity to the vaccine or similar vaccine, determination of previous immunization history, and the presence of any contraindications to immunization, current health status, and a current knowledge of the literature concerning the use of the vaccine under consideration.

Intramuscular injections should be given with care in persons suffering from coagulation disorders or on anticoagulant therapy because of risk of hemorrhage<sup>1,9</sup>.

Pneumococcal vaccine and influenza vaccine can be given at the same visit but at different sites with separate sterile needles and syringes without an increase in side effects. Whereas influenza vaccine is given annually, pneumococcal vaccine should generally be given only once to adults<sup>9</sup>.

Influenza virus undergoes significant antigenic changes from time to time, so different vaccines are made every year. INFLUVAC, as now constituted, is not effective against all possible strains of influenza virus<sup>1,2</sup>. Protection is limited to those strains of virus from which the vaccine is prepared or against closely-related strains<sup>1,2</sup>.

The use of fractional doses in an attempt to reduce the severity of adverse reactions cannot be recommended because there is insufficient evidence on the safety or efficacy of such smaller doses<sup>1</sup>.

As with any vaccine, immunization with INFLUVAC may not protect 100% of susceptible individuals.

### **Carcinogenesis and Mutagenesis**

Not applicable.

### **Cardiovascular**

Not applicable.

### **Dependence/Tolerance**

Not applicable.

### **Ear/Nose/Throat**

Not applicable.

**Endocrine and Metabolism**

Not applicable.

**Gastrointestinal**

Not applicable.

**Genitourinary**

Not applicable.

**Hematologic**

See **ADVERSE REACTIONS**

**Hepatic/Biliary/Pancreas**

Not applicable.

**Immune**

Not applicable.

**Neurologic**

See **ADVERSE REACTIONS**

**Ophthalmologic**

Not applicable.

**Peri-Operative Considerations**

Not applicable.

**Psychiatric**

Not applicable.

**Renal**

Not applicable.

**Respiratory**

Not applicable.

**Sensitivity/Resistance**

See **ADVERSE REACTIONS.**

**Sexual Function/Reproduction**

Not applicable.



## **Skin**

Not applicable.

## **Special Populations**

### **Pregnant Women:**

Inactivated influenza vaccines, such as INFLUVAC, can be used in all stages of pregnancy. Larger datasets on safety are available for the second and third trimester, compared with the first trimester; however, data from worldwide use of influenza vaccine do not indicate any adverse foetal and maternal outcomes attributable to the vaccine.

### **Nursing Women:**

Evidence indicates that influenza vaccine is safe for breastfeeding mothers<sup>1</sup>.

### **Fertility:**

No fertility data are available

### **Geriatrics (> 65 years of age):**

INFLUVAC is indicated in people 65 years of age and over<sup>1, 6, 7</sup>(see INDICATIONS AND CLINICAL USE).

## **Monitoring and Laboratory Tests**

Following influenza vaccination, false positive results in serology tests using the ELISA method to detect antibodies against HIV1, Hepatitis C and especially HTLV1 have been observed. The Western Blot technique disproves the results. The transient false positive reactions could be due to the IgM response to the vaccine.

## **ADVERSE REACTIONS**

### **Adverse Drug Reaction Overview**

Vaccination with INFLUVAC (influenza vaccine, surface antigen, inactivated) cannot cause influenza because the vaccine does not contain live virus.

Local reactions include: redness, swelling, itching, warmth, pain, restriction in arm movement, induration and blue spots<sup>1, 12</sup>. The most frequent local reaction is soreness at the injection site lasting up to 2 days in adults but rarely interferes with normal activities<sup>12</sup>. Prophylactic acetaminophen may decrease the frequency of pain at the injection site<sup>1, 14</sup>.

Systemic reactions: fever, increased sweating, headache, malaise, shivering, myalgia, arthralgia, and fatigue<sup>1, 12</sup>. The most frequent systemic reaction is headache<sup>12</sup>.

Allergic responses to influenza vaccine, which in rare cases could lead to anaphylactic shocks<sup>12, 13</sup>, are probably a consequence of hypersensitivity to some vaccine component.

Neurological disorders which have been reported in persons after influenza vaccination include neuritis, encephalomyelitis, febrile convulsions and paresthesia<sup>12, 13, 15, 16</sup>.

Rare cases of systemic vasculitis have been reported in persons after influenza vaccination, but a causal relation has not been established<sup>13</sup>.

### Clinical Trial Adverse Drug Reactions

A total of 1856 patients have been given INFLUVAC with thimerosal or INFLUVAC thimerosal-free in clinical trials. The safety of INFLUVAC was assessed in the following clinical trials: annual strain composition update requirement, including at least 50 adults aged 18-60 years and at least 50 elderly subjects aged 60 years or older, conducted during the period of 1993 to 2002 using INFLUVAC with thimerosal; a study comparing INFLUVAC thimerosal-free and INFLUVAC with thimerosal; a study with INFLUVAC thimerosal-free; and a study of 52 high-risk children (6 months to 4 years) vaccinated with INFLUVAC with thimerosal.

Safety evaluation (i.e. local and systemic reactogenicity) is performed during the first 3 days following vaccination.

The following undesirable effects have been observed during clinical trials with the following frequencies (Table 1).

**Table 1. Summary of adverse events observed during clinical trials**

System Organ Class	Common $\geq 1/100$ , $< 1/10$
Nervous system disorders	Headache*
Skin and subcutaneous tissue disorders	Sweating*
Musculoskeletal and connective tissue disorders	Myalgia, arthralgia*
General disorders and administration site conditions	Fever, malaise, shivering, fatigue Local reactions: redness, swelling, pain, ecchymosis, induration*.

\*These reactions usually disappear within 1-2 days without treatment.

Data on reactogenicity can be found in Table 2, Table 3 and Table 4.

**Table 2. Local and systemic reactions during three days after vaccination with INFLUVAC, containing thimerosal**

<b>Total N=1596</b>	<b>Adults N* (aged 18 – 59 years) % (n/N)</b>	<b>Elderly N=540 (aged 60 years and over) % (n)</b>
<b>Local reactions</b>		
Redness	12.5 (132/1052)	9.4 (51)
Swelling	10.4 (109/1053)	6.1 (33)
Itching	6.3 (66/1052)	4.4 (24)
Warmth	11.2 (118/1054)	5.9 (32)
Pain on contact	42.6 (449/1055)	9.1 (49)
Continuous pain	8.2 (86/1053)	2.6 (14)
Restriction in arm movement	10.3 (109/1054)	2.2 (12)
Induration	10.2 (107/1048)	6.5 (35)
Blue Spots	2.6 (27 /1052)	2.6 (14)
<b>Systemic reactions</b>		
Fever	4.3 (45/1053)	1.5 (8)
Increased sweating	5.0 (53/1053)	3.7 (20)
Headache	12.9 (136/1052)	8.3 (45)
Malaise	6.0 (63/1053)	4.3 (23)
Insomnia	4.6 (48/1052)	4.8 (26)
Shivering	2.1 (22/1052)	1.9 (10)

\* Number of subjects with non-missing data      %= n / N (number of cases / Number of subjects with non-missing data)

**Table 3. Local and systemic reactions during three days after vaccination with INFLUVAC without thimerosal (n=197)**

Total N=197	Adults N=144 (aged 18 – 59 years) % (n)	Elderly N=53 (aged 60 years and over) % (n)
<b>Local reactions</b>		
Redness	17.4 (25)	3.8 (2)
Swelling	11.8 (17)	3.8 (2)
Itching	3.5 (5)	7.5 (4)
Warmth	7.6 (11)	5.7 (3)
Pain on contact	41.7 (60)	5.7 (3)
Continuous pain	3.5 (5)	1.9 (1)
Restriction in arm movement	13.2 (19)	3.8 (2)
Induration	16.7 (24)	1.9 (1)
Blue spots	4.2 (6)	3.8 (2)
<b>Systemic reactions</b>		
Increased sweating	3.5 (5)	3.8 (2)
Headache	11.8 (17)	1.9 (1)
Malaise	2.8 (4)	3.8 (2)
Insomnia	3.5 (5)	3.8 (2)
Shivering	2.1 (3)	0.0 (0)

**Table 4. Local and systemic reactions during three days after vaccination in children with INFLUVAC containing thimerosal**

Total N=52	Children (aged 6 months to 4 years) % (n)
<b>Local reactions</b>	
Redness	11.5 (6)
Swelling	3.8 (2)
Itching	0.0 (0)
Warmth	0.0 (0)
Pain on contact	0.0 (0)
Continuous pain	0.0 (0)
Restriction in arm movement	0.0 (0)
Induration	7.7 (4)
Blue spots	5.8 (3)
<b>Systemic reactions</b>	
Fever	26.9 (14)
Increased sweating	11.5 (6)
Malaise	11.5 (6)
Insomnia	25.0 (13)
loss of appetite	15.2 (8)
Increased crying	15.2 (8)
Increased irritability	25.0 (13)

Data from annual update studies with INFLUVAC containing thimerosal show local and systemic reactions occurred most frequently during the first day after vaccination (40.7% and 13.3%, respectively). During the second and third day after vaccination, local reaction rates declined to 25.4% and 10.3%, respectively. Systemic reaction rates declined to 9.2% and 6.5%.

Data from clinical studies with INFLUVAC thimerosal-free show local reactions occurred most frequently the first day after vaccination (37.1%) and declined during the second and third day to 30.5 % and 14.7% respectively. As for the systemic reactions, few participants to the study reported systemic reactions, and the numbers reported remained stable during the first three days (8.6%, 7.6% and 5.1% respectively).

As summarized in Table 5, both local and systemic reactions for both formulations are comparable. The most frequent local reaction was pain on contact (31% and 32% for the thimerosal- containing and thimerosal-free vaccine, respectively), and the most frequent systemic reaction was headache (11% and 9% for the thimerosal-containing and thimerosal-free vaccine, respectively).

**Table 5. Comparison of reactogenicity on thimerosal-free vs. thimerosal-containing INFLUVAC**

Measure	Thimerosal-free INFLUVAC n=197 % (n)	thimerosal-containing INFLUVAC n=1692 % (n)
Pain on contact at vaccination site	32% (63)	31% (52)
Headache	9% (18)	11% (19)
Any local symptom	45% (89)	45% (76)
Any systemic symptom	14% (28)	19% (32)
Moderate or severe inconvenience	0% (0)	3% (51)

A clinical study in high-risk children with chronic respiratory or congenital heart disease aged 6 months to 4 years with thimerosal-containing INFLUVAC showed that following either of the two vaccinations, the incidence of any local (23%) and any systemic reactions (48%) in this particular group was considered comparable with those reported in healthy adults.

These children received two separate vaccinations and had the added parameters of loss of appetite, increased crying and irritability. All reactions were recorded in the questionnaire by the parent/guardian (instead of direct reporting).

The reactions recorded were relatively minor in nature and were resolved within a few days.

#### **Less Common Clinical Trial Adverse Drug Reactions (<1%)**

Not applicable.

#### **Abnormal Hematologic and Clinical Chemistry Findings**

Not available/applicable.

#### **Post-Market Adverse Drug Reactions**

Adverse reactions reported from post marketing surveillance are, next to the reactions which have also been observed during clinical trials, the following:

#### **Blood and lymphatic system disorders:**

Transient thrombocytopenia, transient lymphadenopathy

### **Immune system disorders:**

Allergic reactions, in rare cases leading to shock, angioedema

### **Nervous system disorders:**

Neuralgia, paraesthesia, febrile convulsions, neurological disorders, such as encephalomyelitis, neuritis and Guillain Barré syndrome

### **Vascular disorders:**

Vasculitis associated in very rare cases with transient renal involvement

### **Skin and subcutaneous tissue disorders:**

Generalized skin reactions including pruritus, urticaria or non-specific rash

Guillain-Barré Syndrome (GBS) occurred in adults in association with the 1976 swine influenza vaccine, and evidence favours the existence of a causal relation between the vaccine and GBS during that season<sup>1</sup>. In an extensive review of studies since 1976, the United States Institute of Medicine concluded that the evidence is inadequate to accept or reject a causal relation between GBS in adults and influenza vaccines administered after the swine influenza vaccine program in 1976<sup>1</sup>.

In Canada the background incidence of GBS was estimated at just over 20 cases per million population in a study done in Ontario and Quebec<sup>1</sup>. A variety of infectious agents, such as *Campylobacter jejuni*, have been associated with GBS. It is not known whether influenza virus infection itself is associated with GBS. Neither is it known whether influenza vaccination is causally associated with increased risk of recurrent GBS in persons with a previous history of GBS. Avoiding subsequent influenza vaccination of persons known to have developed GBS within 6 to 8 weeks of a previous influenza vaccination appears prudent at this time<sup>1</sup>. The reporting rate of GBS associated with INFLUVAC is concluded to remain within the expected back-ground incidence.

Influenza vaccine is not known to predispose to Reye's Syndrome<sup>1,3</sup>.

Oculorespiratory Syndrome (ORS) has been reported sporadically in Canada, US and Europe following influenza immunization. Starting in the 2000/2001 season, ORS is defined as the onset of bilateral red eyes and/or respiratory symptoms (cough, wheeze, chest tightness, difficulty breathing, difficulty swallowing, hoarseness or sore throat) and/or facial swelling occurring within 24 hours of influenza immunization. The pathophysiologic mechanism underlying ORS remains unknown<sup>1</sup>.

After the 2000-2001 influenza season, fewer ORS cases have been reported to Health Canada. Please refer to the *Canadian Immunization Guide* for further details about administration of vaccine and management of adverse events.

Physicians, nurses and pharmacists should report any immediate adverse reactions arising from any vaccination, or following shortly thereafter, in accordance with local requirements and to the manufacturer: Drug Safety, BGP Pharma ULC, 8401 Trans-Canada Highway Saint-Laurent, QC H4S 1Z1 Canada. Telephone: 1-844-596-9526.

## **DRUG INTERACTIONS**

### **Overview**

No interaction between INFLUVAC (influenza vaccine, surface antigen, inactivated) and other vaccines or medication are known.

### **Drug-Drug Interactions**

INFLUVAC may be given at the same time as other vaccines. Immunization should be carried out on separate limbs. It should be noted that the adverse reactions may be intensified.

The immunological response may be diminished if the patient is undergoing immunosuppressant treatment.

### **Theophylline and Anticoagulants**

Influenza vaccine can inhibit the clearance of theophylline and anticoagulants such as warfarin. However, clinical studies have not shown any adverse effects attributable to these drugs in people receiving influenza vaccine.

### **Drug-Food Interactions**

Not known.

### **Drug-Herb Interactions**

Not known.

### **Drug-Laboratory Interactions**

Following influenza vaccination, false positive results in serology tests using the ELISA method to detect antibodies against HIV1, Hepatitis C and especially HTLV1 have been observed. The Western Blot technique disproves the results. The transient false positive reactions could be due to the IgM response by the vaccine.

### **Drug-Lifestyle Interactions**

#### **Effects on ability to drive and use machines**

INFLUVAC has no or negligible influence on the ability to drive and use machines.

## **DOSAGE AND ADMINISTRATION**

### **Recommended Dose and Dosage Adjustment**

The recommended dose of INFLUVAC for adults above 18 years is 0.5 mL.

### **Missed Dose**

Not applicable.

## **Administration**

Parenteral biological products should be inspected visually for extraneous particulate matter and/or discoloration before administration. If these conditions exist, the product should not be administered.

For information on vaccine administration, see the current Canadian Immunization Guide and the Health Canada Website.

The patient should be given a permanent personal immunization record<sup>9</sup>. In addition, it is essential that the physician or nurse record the immunization history in the permanent medical record of each patient. Thus the permanent office record should contain the name of the vaccine, date given, dose, manufacturer and lot number<sup>9</sup>.

INFLUVAC should be administered by intramuscular or deep subcutaneous injection.

INFLUVAC is a colourless clear liquid, in pre-filled single-dose syringes with / without a needle.

INFLUVAC should be allowed to reach room temperature before use.

For syringes without a needle, remove the cap and attach a needle.

Shake the pre-filled syringe well to uniformly distribute the suspension before administration.

Remove the needle protection, and bleed the syringe of air while holding the needle pointing vertically upward by pressing the plunger in slowly.

Do not administer intravascularly.

Needles should not be recapped, and the syringe should be disposed of properly.

**Reconstitution:** INFLUVAC comes as 0.5 mL suspension ready for injection.

**Oral Solutions :** Not applicable

**Parenteral Products:** Not applicable

## **OVERDOSAGE**

Overdosage is unlikely to have any untoward effect.

For management of a suspected drug overdose, contact your regional Poison Control Centre.



## **ACTION AND CLINICAL PHARMACOLOGY**

### **Mechanism of Action**

INFLUVAC (influenza vaccine, surface antigen, inactivated) is an egg-grown, inactivated influenza virus subunit, trivalent vaccine based on isolated surface antigens of A and B strains of myxovirus influenza. The inoculation of antigen prepared from inactivated influenza virus stimulates the production of specific antibodies. Protection is afforded only against those strains of virus from which the vaccine is prepared or closely related strains.

Influenza A viruses are classified into subtypes on the basis of 2 surface antigens: hemagglutinin (H) and neuraminidase (N)<sup>1,2,3</sup>. Three subtypes of hemagglutinin (H1, H2, H3) and 2 subtypes of neuraminidase (N1, N2) are recognized among influenza A viruses that have caused widespread human disease. Immunity to these antigens, especially to the hemagglutinin, reduces the likelihood of infection and lessens the severity of disease if infection occurs. Infection with a virus of one subtype confers little or no protection against viruses of other subtypes. Antigenic variation over time within a subtype may be so marked that infection or vaccination with one strain may not induce immunity to distantly related strains of the same subtype. Although influenza B viruses have shown more antigenic stability than influenza A viruses, antigenic variation does occur. For these reasons, major epidemics of respiratory disease caused by variants of influenza still occur<sup>1,3</sup>. The antigenic characteristics of current and emerging influenza virus strains provide the basis for selecting the virus strains included in each year's vaccine<sup>1,3</sup>.

Each year's influenza vaccine contains 3 virus strains representing the influenza viruses that are likely to be circulating in Canada on the basis of the recommendation from the World Health Organization<sup>1,2,3</sup> for the northern hemisphere.

### **Pharmacodynamics**

Protective antibody levels are generally obtained within 2 to 3 weeks after vaccination.

### **Pharmacokinetics**

As this is a vaccine product, pharmacokinetic studies are not applicable.

**Absorption:** Not applicable.

**Distribution:** Not applicable.

**Metabolism:** Not applicable.

**Excretion:** Not applicable.

### **Special Populations and Conditions**

**Pediatrics:** Not applicable.

**Geriatrics:** Not applicable.

**Gender:** Not applicable.

**Race:** Not applicable.

**Hepatic Insufficiency:** Not applicable.

**Renal Insufficiency:** Not applicable.

**Genetic Polymorphism:** Not applicable.

### **Duration of Effect**

Protective antibody titres generally last for at least 6 months and may last up to one year or longer<sup>2, 20</sup>. New influenza vaccines are produced each year according to the WHO recommended composition. Patients vaccinated a short time before the start of the expected influenza activity (November in the Northern Hemisphere) may therefore be expected to be protected for influenza infections or its complications during the whole influenza season (November to April).

Serological data over a 52-week period since vaccination in healthy adult subjects aged 18 to 60 years showed a substantial decrease in antibody titres, as is to be expected for Influenza vaccines. Still the 52-week GMT values are markedly elevated as compared to the pre-vaccination values. The observed decline in GMT values over a one year period was approximately 50-70% for both strains. The sustained levels of protective antibody titres are in line with the expectation of protection during an influenza season up to 6 months after vaccination.

### **STORAGE AND STABILITY**

INFLUVAC (influenza vaccine, surface antigen, inactivated) should be stored at 2 to 8°C (in a refrigerator). Do not freeze. Store in the original package in order to protect from light.

Do not use vaccine after expiration date as stated on the label.

In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products.

### **SPECIAL HANDLING INSTRUCTIONS**

INFLUVAC (influenza vaccine, surface antigen, inactivated) should be allowed to reach room temperature before use. Shake well before use. Inspect visually prior to administration.

Any unused product or waste material should be disposed of in accordance with local requirements.

## **DOSAGE FORMS, COMPOSITION AND PACKAGING**

### **Dosage Forms**

INFLUVAC (influenza vaccine, surface antigen, inactivated) is supplied as a suspension for injection in pre-filled syringes (glass, type I) with/ without a needle.

### **Composition**

Each single dose (0.5 mL) contains:

### **Active Ingredients**

For the 2015/2016 season, each dose of INFLUVAC contains neuraminidase and 15mcg of hemagglutinin of the following virus strains:

- A/California/7/2009 (H1N1)pdm09- like strain (A/California/7/2009, X-181)
- A/Switzerland/9715293/2013 (H3N2)-like strain (A/Switzerland/9715293/2013, NIB-88)
- B/Phuket/3073/2013-like strain (B/Phuket/3073/2013, wild type)

### **Other Ingredients**

#### *Excipients*

Potassium chloride	0.1 mg
Potassium dihydrogen phosphate	0.1 mg
Disodium phosphate dihydrate	0.67 mg
Sodium chloride	4.0 mg
Calcium chloride dihydrate	0.067 mg
Magnesium chloride hexahydrate	0.05 mg
Water for Injection	To 0.5 mL

#### *Manufacturing Process Residuals*

INFLUVAC may also contain trace amounts of eggs, chicken protein, formaldehyde, cetyltrimethylammonium bromide, polysorbate 80 and gentamicin.

INFLUVAC is thimerosal-free, mercury-free, and contains no preservative.

### **Packaging**

INFLUVAC is supplied in prefilled glass syringes with/ without a needle, containing 0.5 mL suspension for injection. The syringes are made of neutral glass Type 1. The container closure system for INFLUVAC is free of latex.

INFLUVAC is available in the following formats:

Single pack- syringe is packed in a tamper evident carton box.

Ten pack- syringes are packed in a tamper evident carton box for 10 syringes.

## PART II: SCIENTIFIC INFORMATION

### PHARMACEUTICAL INFORMATION

#### Drug Substance

Proper name: Influenza virus subunit vaccine (surface antigen, inactivated).

Chemical name: Monovalent Bulk containing inactivated hemagglutinin and neuraminidase surface antigens of WHO/NACI recommended strains of influenza virus.

Molecular formula and molecular mass: Not applicable

Structural formula: Not applicable

Physiochemical properties: The Monovalent Bulk is a clear to slightly opalescent liquid. The pH of the Monovalent Bulk is in the range 6.9 to 7.5.

#### Product Characteristics

This vaccine complies with the WHO and NACI recommendations (northern hemisphere) for the 2015-2016 season. The active substances are:

Influenza virus surface antigens (haemagglutinin and neuraminidase) of the following strains:

- A/California/7/2009 (H1N1)pdm09-like strain (A/California/7/2009, X-181)
- A/Switzerland/9715293/2013 (H3N2)-like strain (A/Switzerland/9715293/2013, NIB-88)
- B/Phuket/3073/2013-like strain (B/Phuket/3073/2013, wild type)

The virus strain is supplied as a primary seed virus by the NIBSC (National Institute for Biological Standards and Control, Potters Bar, UK), or by another designated WHO laboratory. The primary seed virus is propagated in embryonated SPF (specific pathogen-free) hens' eggs to generate a master seed virus (MSV). The working seed virus (WSV) is generated by the propagation of the MSV in embryonated SPF hens' eggs.

The WSV is diluted to a seed suspension and then inoculated in embryonated eggs. The inoculated eggs are incubated for approximately 3 days. After incubation, the eggs are cooled to  $5 \pm 3^{\circ}\text{C}$  for 12 - 48 hours.

The allantoic fluid is harvested from the eggs and clarified using a centrifuge to remove cell and egg debris. The clarified allantoic fluid of the single harvest of a strain is separated in a zonal gradient centrifuge (0-60% sucrose). The virus containing fractions with approximately 47 to 35% m/m of sucrose are collected and inactivated by formaldehyde treatment in two stages, first for 18 hours to 3 days and secondly for 4 to 10 days. The inactivated fractions are pooled, filtered and diluted with PBS. The sucrose and formaldehyde is removed by ultrafiltration. The hemagglutinin and neuraminidase are solubilised by the addition of Polysorbate 80 and CTAB. The non-solubilised remainders of the virus particles are removed by centrifugation.

The CTAB and the Polysorbate 80 are removed from the supernatant by adsorption to an adequate quantity of Amberlite XAD-4 resin. After adsorption of the detergents, the Amberlite resin is removed by filtration. PBS is added and the final suspension is sterilised by filtration which is the Monovalent Bulk vaccine.

The manufacture of the drug product (=final lot) involves blending three monovalent bulks, and diluting the drug substance with buffers to produce the final (=trivalent) bulk. The final bulk is filled into single-dose syringes, using an Isolator filling machine to produce the final product.

## **CLINICAL TRIALS**

### **Study demographics and trial design**

Data analysis includes 24 vaccination studies conducted with INFLUVAC (influenza vaccine, surface antigen, inactivated) with thimerosal during the period between 1993-2002, study comparing INFLUVAC (influenza vaccine, surface antigen, inactivated) thimerosal-free and INFLUVAC with thimerosal, and an annual update study with INFLUVAC thimerosal-free. An overview of exposure and demographic data is given in Tables 6-8. A total of 1659 subjects of 6 months and older were vaccinated with standard doses of INFLUVAC with thimerosal: 1010 healthy adults (18 – 60 years) (Table 6), 597 healthy elderly (>60 years)(Table 6), 85 healthy adults aged 18 – 60 years in a comparative trial (Table 6) and 52 high-risk children (6 months to 4 years) (Table 8). A total of 197 subjects of 18 years and older were vaccinated with standard doses of INFLUVAC thimerosal-free (Table 7): 84 subjects aged 18 – 60 years in a comparative trial, 60 healthy subjects aged 18 – 60 years in an annual strain update study and 53 healthy elderly aged 60 years and over in an annual strain update study.

**Table 6. Summary of Demographic Data on INFLUVAC with thimerosal**

Study number	Trial Design	Dosage, route of administration and duration	Number of vaccinees	Mean age (range)	Gender N <sub>male</sub> /N <sub>female</sub>
1	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	70	19.8 (18-31)	30/40
2	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	62	68.0 (55-82)	27/35
3	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	65	19.5 (18-27)	33/32
4	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	66	21.1 (17-51)	33/33
5 <sup>1</sup>	Double blind, randomized, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	124	32.2 (19-59)	46/78
6	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	67.5 (60-79)	38/22
7	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	63	23.6 (21-47)	31/32
8	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	61	67.4 (60-84)	26/35
9	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	40.1 (19-59)	31/29
10 <sup>2</sup>	Randomized, Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	57	28.3 (19-53)	16/41
11	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	61	38.1 (18-59)	33/28
12	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	66.5 (60-79)	35/25
13	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	30.1 (19-57)	37/23
14	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	65.8 (60-77)	32/28
15	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	22.6 (18-42)	33/27
16	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	58	65.1 (60-80)	28/30
17	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	26.1 (19-55)	22/38
18	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	68.0 (60-84)	29/31

Study number	Trial Design	Dosage, route of administration and duration	Number of vaccinees	Mean age (range)	Gender N <sub>male</sub> /N <sub>female</sub>
19	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	30.2 (19-56)	22/38
20	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	56	67.3 (60-79)	27/29
21	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	25.5 (18-55)	24/36
22	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	66.7 (60-80)	35/25
23	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	59	28.4 (18-56)	24/35
24	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	65.7 (60-79)	37/23
25 <sup>3</sup>	Double blind, randomized, parallel groups	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	85	38.2 (18-59)	47/38

<sup>1</sup> A double-blind study with standard vaccine, treated either with deoxycholate (DOC) to reduce endotoxin concentrations, or not treated with DOC. As there were no relevant differences in outcome measures addressing reactogenicity and serology, data for both study arms were pooled for this review. DOC is no longer used in the INFLUVAC manufacturing process.

<sup>2</sup> Comparative, double blind study with egg-derived and cell-culture-derived (MDCK) vaccines. Here, only data for egg derived vaccine were included.

<sup>3</sup> Comparative, double blind parallel study with thimerosal-free INFLUVAC and the then standard INFLUVAC. Here, only the data for the thimerosal-containing standard INFLUVAC were included.

**Table 7. Demographic Data on INFLUVAC thimerosal-free**

Study number	Trial Design	Dosage, route of administration and duration	Number of vaccinees	Mean age (range)	Gender N <sub>male</sub> /N <sub>female</sub>
25 <sup>1</sup>	Double blind, randomized, parallel groups	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	84	38.3 (18-59)	44/40
26 <sup>2</sup> (adults)	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	60	29.8 (18-59)	16/44
26 <sup>2</sup> (elderly)	Open, Baseline controlled	0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 3 weeks	53	68.2 (60-79)	26/27

<sup>1</sup> Comparative, double blind parallel study with thimerosal-free INFLUVAC and the standard INFLUVAC. Here, only the data for the thimerosal-free INFLUVAC were included.

<sup>2</sup> Previously separate annual update studies were performed for (young) adults ( $\geq 18$  and  $\leq 60$  years of age) and elderly subjects ( $>60$  years); in recent annual update studies both age groups participate in the same protocol.

<sup>3</sup> In 2003 no separate annual update study was necessary since the composition of the strains had not changed since the previous Influenza season.

**Table 8. Demographic Data on INFLUVAC thimerosal-containing INFLUVAC in High-Risk children aged 6 months to 4 years**

Study number	Trial Design	Dosage, route of administration and duration	Number of vaccinees	Mean age (range)	Gender N <sub>male</sub> /N <sub>female</sub>
27	Open, Baseline controlled	0.25 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain, intramuscular or deep subcutaneous injection, and 4 weeks	52 <sup>1</sup>	19.5 months (6-48months)	25/27

<sup>1</sup> 52 children that started with the study, of which 51 actually completed the entire study period.



## Study results

### Immunogenicity

Immunogenicity data consisted of pre- and post-vaccination titres per subject and vaccine strain, determined in duplicate. After logarithmic transformation, immunogenicity parameters as requested by the CHMP<sup>19</sup> (Table 9) were calculated per study: mean fold increase (MFI), numbers of subjects exceeding a protective titre of 40 after vaccination (seroprotection (SP<sub>post</sub>)), and numbers of at least fourfold titre rise (seroconversion (SC)). Moreover, pre- and post-vaccination geometric mean titre (GMT), and numbers of subjects exceeding a protective titre of 40 prior to vaccination (SP<sub>pre</sub>), were determined.

**Table 9. Criteria for assessment of influenza vaccines, according to the CHMP<sup>19</sup>**

Age class	Serological parameter	Criteria
Adults 18 to 60 years of age	MFI	> 2.5
	SP (% of subjects exceeding a titre of 40)	> 70%
	SC (% of subjects with seroconversion or at least 4-fold titre rise)	> 40%
Adults ≥60 years of age (Elderly)	MFI	> 2.0
	SP (% of subjects exceeding a titre of 40)	> 60%
	SC (% of subjects with seroconversion or at least 4-fold titre rise)	> 30%

In all 26 studies in young and elderly adults the current CHMP requirement for sufficient immunogenicity (meeting at least one of the criteria for each of the three strains) was met. In fact, in 24 of the 26 studies all three criteria were met for all strains in the vaccine. The absence of thimerosal did not affect the immunogenicity of the vaccine, as all three CHMP criteria for all three strains were met and no differences were found compared to the thimerosal-containing product.

Since there are no CHMP-criteria for children, the CHMP criteria for adult subjects were used to evaluate the data from high-risk children. The CHMP-requirement for immunogenicity was met in this specific population of young children at risk.

Tables 10 to 12 show the serological parameters for all studies in adults/elderly, according to (sub)type. The serological response as measured by a number of parameters was excellent in most cases, which confirms previous observations.

For INFLUVAC with thimerosal all of the 74 MFI-values and SC-values as shown in Table 10, exceeded the CHMP -criteria, as well as 71 of 74 SP<sub>post</sub>-values. In 44 cases, SP<sub>post</sub>-values were even greater than 90%. In three studies, SP<sub>post</sub>-values of some strains did not reach the value as required by the CHMP: Study nr. 2 (elderly) for virus strains A-H<sub>1</sub>N<sub>1</sub> and B and Study nr. 9 (young adults) for virus strain A-H<sub>3</sub>N<sub>2</sub>. The overall CHMP requirement was still met in these three studies (i.e. the other CHMP criteria for these strains were compliant). For the INFLUVAC thimerosal-free, the CHMP criteria for MFI, SC and SP<sub>post</sub> were met in all three strains used.

The comparative study analysed the effect of the absence of the preservative thimerosal on the immunogenicity of the vaccine. The results obtained in the study (Tables 11 and 12) show that the absence of the preservative does not have any effect on the efficacy of the vaccine.

In the study with high-risk children aged 6 months to 4 years (Table 13), the vaccine induced a strong immunogenic response against all three hemagglutinin antigens. In fact, the CHMP - requirement applicable to adults/elderly was also met for this specific group.

**Table 10. Serological parameters for the thimerosal-containing INFLUVAC – Pre- and post-GMT, MFI, Pre- and post-SP and SC**

Study nr.	Subtype	N	GMT <sub>pre</sub> *		GMT <sub>post</sub> *		MFI*		SP <sub>pre</sub> †		SP <sub>post</sub> †		SC†	
1	A-H <sub>3</sub> N <sub>2</sub>	69	13.2	(9.9 - 17.6)	199.3	(150.1 - 264.6)	15.1	(10.3 - 22.1)	20.3	(10.8 - 29.8)	94.2	(88.7 - 99.7)	82.6	(73.7 - 91.6)
	A-H <sub>1</sub> N <sub>1</sub>	69	27.4	(20.2 - 37.2)	423.8	(321.8 - 558.2)	15.5	(10.5 - 22.8)	47.8	(36.0 - 59.6)	100.0		78.3	(68.5 - 88.0)
	B	69	20.9	(16.0 - 27.2)	391.8	(286.1 - 536.5)	18.8	(13.6 - 25.8)	37.7	(26.2 - 49.1)	97.1	(93.1 - 100)	88.4	(80.9 - 96.0)
2	A-H <sub>3</sub> N <sub>2</sub>	53	6.0	(5.2 - 7.0)	89.6	(54.7 - 46.8)	14.9	(9.5 - 23.5)	1.9	(0 - 5.5)	73.6	(61.7 - 85.5)	77.4	(66.1 - 88.6)
	A-H <sub>1</sub> N <sub>1</sub>	53	5.5	(5.0 - 6.1)	32.7	(22.8 - 47.0)	5.9	(4.1 - 8.6)	1.9	(0 - 5.5)	52.8	(39.4 - 66.3)	64.2	(51.2 - 77.1)
	B	53	7.9	(6.6 - 9.5)	35.3	(25.1 - 49.5)	4.4	(3.2 - 6.3)	1.9	(0 - 5.5)	56.6	(43.3 - 69.9)	49.1	(35.6 - 62.5)
3	A-H <sub>3</sub> N <sub>2</sub>	64	13.0	(9.5 - 17.6)	376.7	(270.0 - 525.5)	29.1	(17.8 - 47.5)	21.9	(11.7 - 32.0)	96.9	(92.6 - 100)	84.4	(75.5 - 93.3)
	A-H <sub>1</sub> N <sub>1</sub>	64	20.2	(15.1 - 27.0)	212.7	(152.9 - 296.0)	10.5	(7.0 - 15.9)	39.1	(27.1 - 51.0)	92.2	(85.6 - 98.8)	76.6	(66.2 - 86.9)
	B	64	16.1	(11.8 - 21.9)	421.9	(306.6 - 580.4)	26.3	(16.4 - 42.1)	25.0	(14.4 - 35.6)	98.4	(95.4 - 100)	89.1	(81.4 - 96.7)
4	A-H <sub>3</sub> N <sub>2</sub>	66	38.9	(8.9 - 170.5)	1017.3	(261.7 - 3954.9)	26.2	(17.1 - 40.1)	27.3	(16.5 - 38.0)	93.9	(88.2 - 99.7)	83.3	(74.3 - 92.3)
	A-H <sub>1</sub> N <sub>1</sub>	66	62.6	(14.4 - 272.9)	549.1	(139.5 - 2160.7)	8.8	(5.8 - 13.2)	45.5	(33.4 - 57.5)	95.5	(90.4 - 100)	63.6	(52.0 - 75.2)
	B	66	47.4	(10.9 - 206.8)	896.9	(230.5 - 3489.8)	18.9	(12.8 - 27.9)	28.8	(17.9 - 39.7)	90.9	(84.0 - 97.8)	84.8	(76.2 - 93.5)
5	A-H <sub>3</sub> N <sub>2</sub>	123	8.2	(7.1 - 9.5)	112.3	(86.9 - 145.1)	13.7	(10.8 - 17.4)	7.3	(2.7 - 11.9)	82.9	(76.3 - 89.6)	79.7	(72.6 - 86.8)
	A-H <sub>1</sub> N <sub>1</sub>	123	13.0	(10.9 - 15.5)	443.9	(349.7 - 563.3)	34.1	(26.7 - 43.4)	18.7	(11.8 - 25.6)	96.7	(93.6 - 99.9)	94.3	(90.2 - 98.4)
	B	123	32.3	(28.4 - 36.7)	237.4	(194.4 - 289.9)	7.3	(6.2 - 8.7)	48.8	(39.9 - 57.6)	95.1	(91.3 - 98.9)	77.2	(69.8 - 84.6)
6	A-H <sub>3</sub> N <sub>2</sub>	53	6.9	(5.6 - 8.5)	97.8	(62.1 - 154.0)	14.2	(9.3 - 21.5)	9.4	(1.6 - 17.3)	67.9	(55.4 - 80.5)	77.4	(66.1 - 88.6)
	A-H <sub>1</sub> N <sub>1</sub>	53	6.6	(5.7 - 7.6)	134.4	(91.3 - 197.9)	20.4	(13.8 - 30.2)	1.9	(0 - 5.5)	86.8	(77.7 - 95.9)	92.5	(85.3 - 99.6)
	B	53	10.7	(8.4 - 13.6)	115.2	(78.0 - 170.1)	10.8	(7.6 - 15.2)	9.4	(1.6 - 17.3)	84.9	(75.3 - 94.5)	83.0	(72.9 - 93.1)
7	A-H <sub>3</sub> N <sub>2</sub>	58	10.7	(8.0 - 14.2)	165.5	(109.3 - 250.4)	15.5	(10.1 - 23.9)	19.0	(8.9 - 29.1)	87.9	(79.5 - 96.3)	81.0	(70.9 - 91.1)
	A-H <sub>1</sub> N <sub>1</sub>	58	17.3	(13.0 - 22.9)	590.5	(457.5 - 762.2)	34.2	(23.8 - 49.0)	31.0	(19.1 - 42.9)	100.0		96.6	(91.9 - 100)
	B	58	33.0	(26.3 - 41.4)	338.3	(252.6 - 452.9)	10.3	(7.5 - 13.9)	46.6	(33.7 - 59.4)	98.3	(94.9 - 100)	81.0	(70.9 - 91.1)
8	A-H <sub>3</sub> N <sub>2</sub>	61	6.8	(5.6 - 8.3)	56.8	(35.5 - 90.9)	8.3	(5.3 - 13.1)	9.8	(2.4 - 17.3)	63.9	(51.9 - 76.0)	68.9	(57.2 - 80.5)
	A-H <sub>1</sub> N <sub>1</sub>	61	6.9	(5.6 - 8.5)	100.8	(66.3 - 153.4)	14.6	(9.6 - 22.3)	6.6	(0.3 - 12.8)	73.8	(62.7 - 84.8)	78.7	(68.4 - 89.0)
	B	61	15.0	(10.5 - 21.5)	328.4	(207.1 - 520.8)	21.9	(14.1 - 33.9)	29.5	(18.1 - 41.0)	88.5	(80.5 - 96.5)	83.6	(74.3 - 92.9)
9	A-H <sub>3</sub> N <sub>2</sub>	60	6.2	(5.3 - 7.3)	54.9	(33.4 - 90.0)	8.8	(5.4 - 14.3)	5.0	(0 - 10.5)	56.7	(44.1 - 69.2)	66.7	(54.7 - 78.6)
	A-H <sub>1</sub> N <sub>1</sub>	60	8.7	(6.7 - 11.3)	149.7	(103.0 - 217.6)	17.2	(11.8 - 24.9)	13.3	(4.7 - 21.9)	85.0	(76.0 - 94.0)	86.7	(78.1 - 95.3)
	B	60	11.8	(8.7 - 16.0)	252.8	(170.8 - 374.1)	21.4	(14.2 - 32.2)	21.7	(11.2 - 32.1)	95.0	(89.5 - 100)	85.0	(76.0 - 94.0)

\* Geometric means and 95% confidence intervals

† Proportion (x 100%) and 95% confidence intervals

**Table 10 (Cont'd). Serological parameters for the thimerosal-containing INFLUVAC - Pre- and post-GMT, and MFI Pre- and post-SP and SC**

Study nr.	Subtype	N	GMT <sub>pre</sub> *		GMT <sub>post</sub> *		MFI*		SP <sub>pre</sub> †		SP <sub>post</sub> †		SC†	
10‡	A-H <sub>1</sub> N <sub>1</sub>	57	8.4	(6.6 - 10.8)	311.5	(211.5 - 458.7)	37.0	(23.8 - 57.5)	10.5	(2.6 - 18.5)	91.2	(83.9 - 98.6)	86.0	(76.9 - 95.0)
	B	57	17.1	(12.3 - 23.9)	300.8	(199.8 - 452.7)	17.5	(11.8 - 26.1)	26.3	(14.9 - 37.7)	89.5	(81.5 - 97.4)	89.5	(81.5 - 97.4)
11	A-H <sub>3</sub> N <sub>2</sub>	59	12.7	(9.2 - 17.5)	388.0	(279.5 - 538.6)	30.7	(21.4 - 44.0)	25.4	(14.3 - 36.5)	100.0		93.2	(86.8 - 99.6)
	A-H <sub>1</sub> N <sub>1</sub>	59	11.8	(8.5 - 16.4)	399.1	(240.5 - 478.1)	28.7	(18.7 - 44.0)	22.0	(11.5 - 32.6)	94.9	(89.3 - 100)	86.4	(77.7 - 95.2)
	B	59	15.1	(11.6 - 19.8)	282.8	(189.5 - 422.1)	18.7	(12.4 - 28.3)	11.9	(3.6 - 20.1)	93.2	(86.8 - 99.6)	86.4	(77.7 - 95.2)
12	A-H <sub>3</sub> N <sub>2</sub>	60	16.9	(11.7 - 24.4)	183.8	(130.3 - 259.4)	10.9	(7.1 - 16.6)	30.0	(18.4 - 41.6)	90.0	(82.4 - 97.6)	66.7	(54.7 - 78.6)
	A-H <sub>1</sub> N <sub>1</sub>	60	22.7	(15.1 - 34.2)	170.6	(119.7 - 243.2)	7.5	(4.7 - 12.0)	38.3	(26.0 - 50.6)	86.7	(78.1 - 95.3)	60.0	(47.6 - 72.4)
	B	60	30.5	(19.7 - 47.0)	164.6	(110.9 - 244.3)	5.4	(3.4 - 8.5)	48.3	(35.7 - 61.0)	86.7	(78.1 - 95.3)	48.3	(35.7 - 61.0)
13	A-H <sub>3</sub> N <sub>2</sub>	60	49.5	(35.0 - 69.9)	1052.7	(854.8 - 1296.4)	21.3	(13.5 - 33.5)	65	(51 - 77)	100	(93 - 100)	78	(65 - 88)
	A-H <sub>1</sub> N <sub>1</sub>	60	20.6	(14.1 - 30.0)	690.5	(568.1 - 839.3)	33.6	(22.0 - 51.3)	38	(26 - 52)	100	(93 - 100)	90	(79 - 97)
	B	60	12.9	(8.6 - 19.5)	631.3	(457.2 - 871.7)	48.8	(31.7 - 75.0)	23	(13 - 37)	98	(91 - 100)	90	(79 - 97)
14	A-H <sub>3</sub> N <sub>2</sub>	60	17.2	(12.6 - 23.3)	770.2	(546.6 - 1085.3)	44.9	(29.4 - 68.4)	27	(16 - 40)	95	(86 - 99)	87	(75 - 95)
	A-H <sub>1</sub> N <sub>1</sub>	60	10.3	(7.6 - 14.1)	217.5	(147.4 - 320.8)	21.0	(13.8 - 32.0)	20	(10 - 33)	88	(77 - 96)	82	(69 - 91)
	B	60	7.4	(5.8 - 9.4)	124.1	(79.6 - 193.6)	16.9	(11.1 - 25.7)	10	(3 - 21)	75	(62 - 86)	68	(54 - 80)
15	A-H <sub>3</sub> N <sub>2</sub>	60	11.8	(9.2 - 15.2)	197.2	(152.8 - 254.4)	16.7	(12.0 - 23.1)	20	(10 - 33)	98	(91 - 100)	83	(71 - 92)
	A-H <sub>1</sub> N <sub>1</sub>	60	6.2	(5.3 - 7.3)	270.4	(196.2 - 372.6)	43.4	(30.8 - 61.2)	5	(1 - 14)	93	(83 - 99)	93	(83 - 99)
	B	60	30.4	(20.8 - 44.5)	489.0	(365.5 - 654.3)	16.1	(10.8 - 24.0)	43	(30 - 57)	95	(86 - 99)	77	(63 - 87)
16	A-H <sub>3</sub> N <sub>2</sub>	58	14.8	(10.3 - 21.2)	185.9	(136.6 - 253.2)	12.6	(8.4 - 18.9)	28	(16 - 41)	93	(83 - 99)	71	(57 - 82)
	A-H <sub>1</sub> N <sub>1</sub>	58	6.6	(5.4 - 7.9)	94.9	(60.1 - 149.9)	14.4	(9.4 - 22.2)	9	(2 - 20)	71	(57 - 82)	69	(55 - 81)
	B	58	13.5	(9.3 - 19.6)	192.0	(131.0 - 281.3)	14.2	(9.8 - 20.6)	22	(12 - 36)	83	(70 - 92)	74	(60 - 85)
17	A-H <sub>3</sub> N <sub>2</sub>	58	14.1	(10.0 - 20.0)	161.3	(117.7 - 221.0)	11.4	(7.7 - 17.0)	29	(18 - 43)	90	(78 - 97)	67	(53 - 79)
	A-H <sub>1</sub> N <sub>1</sub>	58	6.0	(5.3 - 6.9)	336.1	(212.0 - 532.9)	55.7	(36.0 - 86.4)	3	(0 - 12)	88	(76 - 96)	88	(76 - 96)
	B	58	34.9	(23.2 - 52.5)	965.0	(794.6 - 1171.9)	27.6	(18.4 - 41.3)	52	(38 - 66)	100	(93 - 100)	88	(76 - 96)
18	A-H <sub>3</sub> N <sub>2</sub>	60	19.9	(13.7 - 28.7)	94.7	(62.5 - 143.4)	4.8	(3.2 - 7.2)	35	(23 - 49)	77	(63 - 87)	40	(27 - 54)
	A-H <sub>1</sub> N <sub>1</sub>	60	28.4	(18.5 - 43.8)	155.3	(105.9 - 227.7)	5.5	(3.5 - 8.6)	45	(32 - 59)	87	(75 - 95)	47	(33 - 61)
	B	60	117.8	(79.7 - 174.3)	482.9	(371.7 - 627.4)	4.1	(2.9 - 5.8)	83	(71 - 92)	98	(91 - 100)	42	(29 - 56)

† Proportion (x 100%) and 95% confidence intervals

‡ In this study a bivalent vaccine was used

\* Geometric means and 95% confidence intervals

**Table 10 (Cont'd). Serological parameters for the thimerosal-containing INFLUVAC - Pre- and post-GMT, and MFI Pre- and post-SP and SC**

Studynr.	Subtype	N	GMT <sub>pre</sub> *		GMT <sub>post</sub> *		MFI*		SP <sub>pre</sub> †		SP <sub>post</sub> †		SC†	
19	A-H <sub>3</sub> N <sub>2</sub>	60	31.7	(19.8 – 50.8)	613.3	(451.1 – 833.8)	19.3	(11.5 – 32.5)	53	(39 - 67)	98	(91 - 100)	68	(55 - 80)
	A-H <sub>1</sub> N <sub>1</sub>	60	5.4	(4.6 – 6.4)	255.7	(182.4 – 358.6)	47.2	(33.0 – 67.5)	2	(0 - 9)	98	(91 - 100)	97	(88 - 100)
	B	60	46.5	(28.7 – 75.5)	1060.6	(791.0 – 1422.2)	22.8	(14.2 – 36.7)	60	(46 - 73)	98	(91 - 100)	77	(63 - 87)
20	A-H <sub>3</sub> N <sub>2</sub>	56	54.9	(31.7 – 95.1)	583.7	(407.0 – 837.2)	10.6	(6.6 – 17.1)	63	(48 - 76)	98	(90 - 100)	70	(55 - 82)
	A-H <sub>1</sub> N <sub>1</sub>	56	6.4	(5.2 – 7.9)	82.7	(54.0 – 126.8)	12.9	(8.4 – 19.6)	7	(1 - 18)	82	(69 - 92)	77	(63 - 88)
	B	56	51.4	(30.6 – 86.4)	671.2	(465.6 – 967.7)	13.1	(7.8 – 21.8)	59	(44 - 72)	96	(87 - 100)	68	(54 - 80)
21	A-H <sub>3</sub> N <sub>2</sub>	60	12.3	(8.9 – 17.2)	300.0	(244.2 – 368.5)	24.3	(16.6 – 35.6)	23	(13 - 37)	98	(91 - 100)	85	(73 - 93)
	A-H <sub>1</sub> N <sub>1</sub>	60	8.5	(6.5 – 11.3)	344.0	(273.7 – 432.5)	40.2	(29.1 – 55.7)	13	(5 - 25)	100	(94 - 100)	93	(83 - 99)
	B	60	29.6	(19.2 – 45.7)	426.4	(360.6 – 504.2)	14.4	(9.4 – 22.0)	50	(36 - 64)	100	(94 - 100)	77	(63 - 87)
22	A-H <sub>3</sub> N <sub>2</sub>	60	21.7	(15.2 - 30.8)	210.4	(153.4 – 288.6)	9.7	(6.2 – 15.1)	50	(36 - 64)	95	(86 - 99)	62	(48 - 74)
	A-H <sub>1</sub> N <sub>1</sub>	60	11.6	(8.8 – 15.4)	144.3	(110.0 – 189.1)	12.4	(8.1 – 18.9)	2	(10 - 33)	95	(86 - 99)	72	(58 - 83)
	B	60	29.3	(20.0 – 42.8)	189.6	(136.9 – 262.7)	6.5	(4.5 – 9.3)	57	(43 - 70)	95	(86 - 99)	65	(51 - 77)
23	A-H <sub>3</sub> N <sub>2</sub>	59	15.7	(10.9 – 22.7)	237.7	(193.0 – 291.4)	15.1	(9.9 – 23.1)	32	(21 - 46)	100		75	(61 - 85)
	A-H <sub>1</sub> N <sub>1</sub>	59	6.1	(5.1 – 7.3)	256.2	(204.2 – 321.5)	42.0	(31.4 – 56.2)	7	(2 - 17)	97	(87 - 99)	93	(83 - 98)
	B	59	6.2	(5.22 – 7.4)	73.4	(56.9 – 94.8)	11.8	(8.9 – 15.7)	5	(1 – 15)	78	(65 - 87)	68	(54 - 79)
24	A-H <sub>3</sub> N <sub>2</sub>	59	24.7	(16.3 – 37.3)	283.2	(217.1 – 369.3)	11.5	(7.8 - 16.8)	41	(28 – 54)	93	(83 - 98)	71	(58 - 82)
	A-H <sub>1</sub> N <sub>1</sub>	59	7.4	(5.8 – 9.5)	212.8	(172.9 – 261.8)	28.7	(20.8 – 39.5)	12	(5 – 24)	97	(87 - 99)	88	(76 - 95)
	B	59	6.7	(5.4 – 8.1)	69.8	(51.9 – 94.0)	10.5	(7.6 – 14.4)	5	(1 – 15)	81	(69 - 90)	76	(63 - 86)
25**	A-H <sub>3</sub> N <sub>2</sub>	83	18.6	(14.1 – 24.5)	231.5	(185.8 – 288.4)	12.4	(8.8 – 17.6)	35	(25 – 45)	98	(94 – 100)	70	(60 – 80)
	A-H <sub>1</sub> N <sub>1</sub>	83	5.9	(5.2 – 6.6)	107.9	(82.1 – 142.0)	18.3	(13.9 – 24.2)	4	(0 – 8)	84	(77 – 92)	82	(74 – 90)
	B	83	5.9	(5.3 – 6.6)	61.3	(45.1 – 83.5)	10.3	(7.6 – 14.2)	2	(0 – 6)	72	(63 – 82)	67	(57 – 78)

\*Geometric means and 95% confidence intervals;

\*\* Subjects vaccinated with thimerosal-containing INFLUVAC in study S201.3.118

† Proportion (x 100%) and 95% confidence intervals

**Table 11. Serological parameters for the INFLUVAC thimerosal-free - Pre- and post-GMT, MFI, Pre- and post-SP, and SC**

Study nr.	Subtype	N	GMT <sub>pre</sub> *	GMT <sub>post</sub> *	MFI*	SP <sub>pre</sub> *	SP <sub>post</sub> *	SC*	
25 <sup>1</sup>	A-H <sub>3</sub> N <sub>2</sub>	84	13.4 (10.4 – 17.3)	254.8 (207.0 – 313.7)	19.0 (14.1 – 25.7)	23 (14 – 32)	98 (94 – 100)	85 (77 – 92)	
	A-H <sub>1</sub> N <sub>1</sub>	84	5.8 (5.1 – 6.6)	131.2 (99.7 – 172.5)	22.7 (17.2 – 29.9)	4 (0 – 8)	86 (78 – 93)	82 (74 – 90)	
	B	84	5.1 (4.9 – 5.4)	71.2 (53.9 – 94.0)	13.9 (10.6 – 18.3)	0	77 (68 – 86)	77 (68 – 86)	
26 <sup>2</sup>	A-H <sub>3</sub> N <sub>2</sub>	59 <sup>2</sup>	30.9 (21.3 – 44.8)	385.5 (337.4 – 440.4)	12.5 (8.3 – 18.8)	58 (44 – 70)	100 (94 – 100)	75 (62 – 85)	
	adults	A-H <sub>1</sub> N <sub>1</sub>	59 <sup>2</sup>	7.5 (5.8 – 9.6)	307.5 (263.1 – 359.5)	41.0 (30.7 – 54.9)	12 (5 – 23)	100 (94 – 100)	93 (84 – 98)
		B	59 <sup>2</sup>	14.5 (10.6 – 19.8)	250.5 (217.3 – 288.9)	17.3 (13.2 – 22.7)	34 (22 – 47)	100 (94 – 100)	97 (88 – 100)
26 <sup>2</sup> elderly	A-H <sub>3</sub> N <sub>2</sub>	53	34.5 (22.6 – 52.6)	262.2 (205.4 – 334.8)	7.6 (5.0 – 11.5)	53 (39 – 67)	96 (87 – 100)	64 (50 – 77)	
	A-H <sub>1</sub> N <sub>1</sub>	53	13.5 (9.8 – 18.5)	106.8 (84.7 – 134.7)	7.9 (5.3 – 11.9)	32 (20 – 46)	96 (87 – 100)	62 (48 – 75)	
	B	53	20.9 (14.8 – 29.6)	182.9 (152.8 – 219.0)	8.7 (6.1 – 12.5)	42 (28 – 56)	98 (90 – 100)	75 (62 – 86)	

\* Geometric means and 95% confidence intervals;

<sup>1</sup> Subjects vaccinated with INFLUVAC thimerosal-free in study S201.3.118

<sup>2</sup> The annual update 2004 (protocol S201.3.120) studied adults and elderly populations in one protocol. From 60 subjects 18-60 years of age, one subject's data were excluded for serology sampling because of an intercurrent infection during the study.

† Proportion (x 100%) and 95% confidence intervals

**Table 12. Serological parameters for the INFLUVAC thimerosal-free and INFLUVAC thimerosal containing- Pre- and post-GMT, MFI, Pre- and post-SP, and SC**

Study nr.	Subtype	N	GMT <sub>pre</sub> *	GMT <sub>post</sub> *	MFI*	SP <sub>pre</sub> *	SP <sub>post</sub> *	SC*
25 <sup>1</sup>	A-H <sub>3</sub> N <sub>2</sub>	84	13.4 (10.4 – 17.3)	254.8 (207.0 – 313.7)	19.0 (14.1 – 25.7)	23 (14 – 32)	98 (94 – 100)	85 (77 – 92)
	A-H <sub>1</sub> N <sub>1</sub>	84	5.8 (5.1 – 6.6)	131.2 (99.7 – 172.5)	22.7 (17.2 – 29.9)	4 (0 – 8)	86 (78 – 93)	82 (74 – 90)
	B	84	5.1 (4.9 – 5.4)	71.2 (53.9 – 94.0)	13.9 (10.6 – 18.3)	0	77 (68 – 86)	77 (68 – 86)
25**	A-H <sub>3</sub> N <sub>2</sub>	83	18.6 (14.1 – 24.5)	231.5 (185.8 – 288.4)	12.4 (8.8 – 17.6)	35 (25 – 45)	98 (94 – 100)	70 (60 – 80)
	A-H <sub>1</sub> N <sub>1</sub>	83	5.9 (5.2 – 6.6)	107.9 (82.1 – 142.0)	18.3 (13.9 – 24.2)	4 (0 – 8)	84 (77 – 92)	82 (74 – 90)
	B	83	5.9 (5.3 – 6.6)	61.3 (45.1 – 83.5)	10.3 (7.6 – 14.2)	2 (0 – 6)	72 (63 – 82)	67 (57 – 78)

<sup>1</sup> Subjects vaccinated with INFLUVAC thimerosal-free in study S201.3.118

\*\* Subjects vaccinated with thimerosal-containing INFLUVAC in study S201.3.118

**Table 13. Serological parameters for the thimerosal-containing INFLUVAC - Pre- and post-GMT, MFI, Pre- and post-SP, and SC; high-risk children aged 6 months to 4 years**

Study nr	Subtype	N	GMT <sub>pre</sub> *	GMT <sub>post</sub> *	MFI*	SP <sub>pre</sub> †	SP <sub>post</sub> †	SC†
27	A-H <sub>3</sub> N <sub>2</sub>	51	13.1 (8.7 – 19.6)	76.2 (40.9 – 142.2)	5.8 (4.3 – 7.9)	25 (14 – 40)	55** (40 – 69)	55 (40 – 69)
	A-H <sub>1</sub> N <sub>1</sub>	51	5.2 (4.8 – 5.6)	56.0 (38.1 – 82.3)	10.8 (7.5 – 15.4)	2 (0 – 11)	71 (56 – 83)	71 (56 – 81)
	B	51	6.2 (5.1 – 7.6)	65.3 (44.3 – 96.4)	10.5 (7.4 – 14.8)	6 (1 – 17)	71 (56 – 83)	69 (54 – 81)

\* Geometric means and 95% confidence intervals;

† Proportion (x 100%) and 95% confidence intervals

\*\* Compared to the CPMP criteria for adults and elderly subjects, postvaccination seroprotection levels were met for the A-H<sub>1</sub>N<sub>1</sub> and B strains. The A-H<sub>3</sub>N<sub>2</sub> strain showed a somewhat lower response though still offering protection to a large group of vaccinees.

## **Safety**

Data relating to the safety of INFLUVAC with thimerosal were obtained in twenty-four clinical studies in adults/elderly and one study in high-risk children aged 6 months to 4 years conducted in the years 1993 to 2002 and from post marketing surveillance until December 2003. In addition, the safety of a new formulation of thimerosal-free INFLUVAC was assessed.

Table 14 shows the overall reaction incidence according to the time period after vaccination with thimerosal-containing INFLUVAC. Local and systemic reactions occurred most frequently during the first day after vaccination (40.7% and 13.3%, respectively). During the second and third day after vaccination, local reaction rates declined to 25.4% and 10.3%, respectively. Systemic reaction rates declined to 9.2% and 6.5%.

The results obtained for the thimerosal-free INFLUVAC are shown in Table 15. As with the thimerosal-containing INFLUVAC, local reactions occurred most frequently the first day after vaccination (37.1%) and declined during the second and third day to 30.5 % and 14.7% respectively. These numbers are comparable to the ones obtained with the thimerosal-containing vaccine. As for the systemic reactions, only a few participants in the study reported systemic reactions, and the numbers reported remained stable during the first three days (8.6%, 7.6% and 5.1% respectively). These numbers are comparable to the rate of systemic reactions obtained on day three after vaccination with the thimerosal-containing vaccine.



**Table 14. Vaccine reaction according to time period after vaccination with thimerosal-containing INFLUVAC**

Study number	Number	Any local reaction			Any systemic reaction		
		0-24 h	24-48 h	48-72 h	0-24 h	24-48 h	48-72 h
1	69	38	19	6	14	12	13
2	61	14	15	10	10	7	5
3	65	39	16	6	15	12	7
4	66	43	21	7	15	8	10
5	124	40	18	4	20	15	6
6	59	7	5	2	5	7	2
7	59	31	14	3	6	6	3
8	61	9	9	7	6	6	6
9	60	10	5	4	4	4	4
10	57	33	14	6	15	3	3
11	61	23	19	8	6	7	3
12	60	8	6	3	7	4	2
13	60	45	27	6	11	7	5
14	60	12	8	6	6	3	2
15	60	45	34	12	6	3	1
16	58	13	9	4	6	4	3
17	58	48	33	8	7	2	0
18	60	10	6	4	5	1	1
19	60	40	24	9	4	7	6
20	56	10	12	5	7	7	4
21	60	39	30	10	8	1	1
22	60	15	14	8	4	5	5
23	59	39	19	7	6	3	1
24	58	8	2	2	12	5	4
25*	85	30	27	17	8	8	7
All	1596	649 (40.7%)	406 (25.4%)	164 (10.3%)	213 (13.3%)	147 (9.2%)	104 (6.5%)

\* Subjects vaccinated with thimerosal-containing INFLUVAC in study S201.3.118

**Table 15. Vaccine reaction according to time period after vaccination with thimerosal-free INFLUVAC**

Study number	Number	Any local reaction			Any systemic reaction		
		0-24 h	24-48 h	48-72 h	0-24 h	24-48 h	48-72 h
25*	84	26	22	12	5	6	6
26 (adults)	60	40	31	15	9	7	2
26 (elderly)	53	7	7	2	3	2	2
All	197	73 (37.1%)	60 (30.5%)	29 (14.7%)	17 (8.6%)	15 (7.6%)	10 (5.1%)

\* Subjects vaccinated with thimerosal-free INFLUVAC in study S201.3.118

“Any local“ and “any systemic” reactions occurred in 45% and 19%, respectively for the thimerosal-containing vaccine and 45% and 14%, respectively for the thimerosal-free vaccine. The severity of these reactions was generally judged as mild. The most frequent local reaction was pain on contact (31% and 32% for the thimerosal- containing and thimerosal-free vaccine, respectively), and the most frequent systemic reaction was headache (11% and 9% for the thimerosal-containing and thimerosal-free vaccine, respectively). The overall inconvenience experienced after vaccination was rated predominantly as mild. Moderate or severe inconvenience occurred in only 3% for the thimerosal-containing vaccine while no subject vaccinated with the thimerosal-free vaccine reported moderate or severe inconvenience.

Reactions tend to occur in the first 24 hours irrespective of the presence or absence of thimerosal. Data are in line with the general perception that vaccine reactions may last for one or two days.

In summary, although an incidence rate for local symptoms of approximately 45% may appear high, it should be realized that these data are derived from clinical trials where the participants were encouraged to report even the slightest symptoms. A more realistic measure for relevant vaccine-induced side-effects in the general population is the item “moderate or severe inconvenience”. An incidence of 3% for this variable and the generally short duration of the symptoms are surely acceptable. Moreover, after removal of the preservative thimerosal from INFLUVAC, the vaccine remained at least as safe as the vaccine containing thimerosal with 45% reporting local symptoms and none reporting ‘moderate or severe inconvenience’.

Safety in high-risk children

A study in high-risk children with chronic respiratory or congenital heart disease aged 6 months to 4 years (Table 16), showed that the vaccine was well tolerated<sup>5</sup>. Following either of the two vaccinations, the incidence of any local (23%) and any systemic reactions (48%) in this particular group was considered comparable with those reported in healthy adults. The reactions recorded were relatively minor in nature and were resolved within a few days.

**Table 16. Reported vaccine reactions after vaccination (72 hrs) with thimerosal-containing INFLUVAC in high-risk children aged 6 months to 4 years**

	Distribution of Reactions after:											
	1 <sup>st</sup> vaccination				2 <sup>nd</sup> vaccination				Any vaccination			
	Yes		No		Yes		No		Yes		No	
	N	%	N	%	N	%	N	%	N	%	N	%
Any Local Reactions	8	15	44	85	7	14	44	86	12	23	40	77
Any Systemic Reactions	17	33	35	67	12	24	39	76	25	48	27	52
Any Reactions	23	44	29	56	14	27	37	73	29	56	23	44

Although a total of fifteen serious adverse events were reported in thirteen of the children (as defined by hospitalization) these were relatively minor events. Due to the underlying chronic respiratory or congenital heart disease in these patients and their young age, it is understandable for their physician to hospitalize them, even in case of minor events which could otherwise be treated at home. Four of the serious adverse events were arranged admissions (for cardiac catheterization (3) or jejunal biopsy).

Only two of these serious adverse events (in two subjects) were thought by the investigators to be possibly related to the vaccine: “Increased cough and diarrhea”, and “Pyrexia, runny nose and cough”.

Safety in asthmatic children

Safety data of INFLUVAC with thimerosal was presented in a recent publication on an investigator initiated placebo controlled study in 6-18 year old asthmatic children, who had taken

asthma medication in the year previous to the study<sup>4</sup>. The study was performed during two consecutive influenza seasons (1999-2000 and 2000-2001), but individual patients could only participate for one season. A total of 696 children participated in this study of which 347 were vaccinated with thimerosal-containing INFLUVAC. Influenza-related asthma exacerbations were of comparable number and severity in the group vaccinated with the vaccine and the placebo group. It was found that the duration of the exacerbations was 3 days shorter in the group vaccinated with the INFLUVAC. No serious adverse events to the vaccine were observed in this study.

### **Comparative Bioavailability Studies**

Not applicable

### **DETAILED PHARMACOLOGY**

Specific pre-clinical studies have not been conducted for INFLUVAC.

### **MICROBIOLOGY**

Specific pre-clinical studies have not been conducted for INFLUVAC.

### **TOXICOLOGY**

Specific pre-clinical studies have not been conducted for INFLUVAC.

## REFERENCES

1. National Advisory Committee on Immunization (NACI): Statement on seasonal influenza vaccine for the 2015-2016 season. Canada Communicable Disease Report, <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc>. To be published in 2015.
2. Recommended composition of influenza virus vaccines for use in the 2015-2016 northern hemisphere influenza season. Wkly Epidemiol Rec. 2015 Mar 13; 90(11): 97-108.
3. CDC. Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2004;53:1-40
4. Bueving HJ, Bernsen RM, de Jongste JC, et al. Influenza vaccination in asthmatic children: randomised double-blind placebo-controlled trial. Am.J.Respir.Crit Care Med. 2004;169:488-93. 1.
5. Daubeney P, Taylor CJ, McGaw J, et al. Immunogenicity and tolerability of a trivalent influenza subunit vaccine (Influvac) in high-risk children aged 6 months to 4 years. BJCP 1997;51(2):87-90.
6. Nichol KL, et al. The efficacy and cost effectiveness of vaccination against influenza among elderly persons living in the community. N Engl J Med 1994;331:778-84.
7. Fedson DS, et al. Clinical effectiveness of influenza vaccination in Manitoba. JAMA 1993;270:1956-61.
8. Editorial. ACIP updates recommendations for the use of antiviral agents in influenza. Special Medical Reports 1995;52:659-60.
9. National Advisory Committee on Immunization: Canadian Immunization Guide, Seventh ed. Her Majesty the Queen in Right of Canada represented by the Minister of Public Works and Government Services Canada: 2006
10. Kubiet MA, Gonzalez-Rothi RJ, Cottey R, Bender BS. Serum antibody response to influenza vaccine in pulmonary patients receiving corticosteroids. Chest 1996;110:367-70.
11. Blumberg EA, Albano C, Fitzpatrick J, Bergin J, Crump C, Hayden FG. The immunogenicity of influenza virus vaccine in solid organ transplant recipients. Clinical Infectious Diseases 1996;22:295-302.
12. Hoofwijk, Th.J. Periodic safety update report for influenza sub-unit vaccine. Internal Solvay Duphar Report INFL02 01/07/1996 - 15/04/1997. 1996
13. Data on file; Abbott Laboratories Limited.
14. Aoki FY, et al. Effects of acetaminophen on adverse effects of influenza vaccination in health care workers. Can Med Assoc J 1993;149(10):1425-30
15. Bedard PM, Gascon G. Fatal outcome of systemic vasculitis following influenza vaccination. Can J Allergy Clin Immun 1999; 4:405-406
16. Guerrero IC, et al. No increased meningoencephalitis after influenza vaccine. N Engl J Med 1979;300 (10):565.

17. Souto JC, Oliver A, Montserrat I, Mateo J, Sureda A, Fontcuberta J. Influenza immunization is a safe procedure in patients undergoing long-term anticoagulation. *Arch Intern Med* 1996;156:1589-92.
18. Hamdy RC, Micklewright M, Beecham VF, Moore SW. Influenza vaccine may enhance theophylline toxicity. A case report and review of the literature. *Journal of the Tennessee Medical Association* 1995;88:463-4.
19. CPMP Note for Guidance on Harmonisation of Requirements for Influenza Vaccines. CPMP/BWP/214/96. 2003.
20. de Jonge S, Palache AM, and Vardy A. Immunogenicity over one year and reactogenicity of influenza subunit vaccine 1986-1987, and the effect of revaccination with vaccine 1987-1988. 1988; Solvay Duphar Report No. 201.5017:1/II/II/M.
21. Palache AM. Influenza sub-unit vaccine - ten years experience. *European Journal of Clinical Research* 1992;3:117-38.
22. Künzel W, Glathe H, Engelmann H, Van Hoecke Ch. Kinetics of humoral antibody response to trivalent inactivated split influenza vaccine in subjects previously vaccinated or vaccinated for the first time. *Vaccine* 1996;14(12):1108-10.
23. Araneo B et. Al DHEAS as an effective vaccine adjuvant in elderly humans. Proof-of-principle studies. *Ann N Y Acad Sci.* 1995 Dec 29;774:232-48.
24. Scheepers H, Kerstens R, De Koning P, and et al. A prospectively randomised, double-blind pilot single rising dose study of MDCK-derived subunit of egg-derived influenza subunit vaccine in volunteers between 18 and 60 years of age: one year after a first administration. 1995; Solvay Duphar Report No. H.203.5001/M:Extension.
25. Scheepers H. A prospectively randomised, double-blind pilot single rising dose study of MDCK-derived subunit of egg-derived influenza subunit vaccine in volunteers between 18 and 60 years of age: one year after a first administration. 1995; Solvay Duphar Report No. H.203.5001/addendum.
26. Siston AM, Rasmussen SA, Honein MA, et al. Pandemic 2009 influenza A(H1N1) virus illness among pregnant women in the United States. *JAMA* 2010; 303 (15): 1517-25.
27. Tamma PD, Ault KA, del Rio C, et al. Safety of influenza vaccination during pregnancy. *Am J Obstet Gynecol* 2009: 547-52.

## PART III: CONSUMER INFORMATION

### <sup>D</sup>INFLUVAC<sup>®</sup>

influenza vaccine, surface antigen, inactivated

This leaflet is Part III of a three-part "Product Monograph" published when INFLUVAC was approved for sale in Canada and is designed specifically for Consumers. This leaflet is a summary and will not tell you everything about INFLUVAC. Contact your doctor or pharmacist if you have any further questions about this vaccine.

#### ABOUT THIS MEDICATION

##### What the medication is used for:

INFLUVAC is a vaccine used to prevent people from developing influenza (the flu), or reduce flu symptoms.

##### What it does:

Like other influenza vaccines, INFLUVAC causes the body to produce antibodies against the virus. This means that when your body is exposed to the flu virus, your body is able to defend itself. The antibodies stop the attacking virus. You cannot catch influenza from INFLUVAC since it only contains portions of the virus, and not the whole live virus. Your body takes 10 to 21 days to produce antibodies after vaccination. Therefore, if you are exposed to influenza immediately before or after your vaccination, you could still develop the illness. The vaccine will not protect you against the common cold, even though some of the symptoms are similar to influenza. Influenza viruses change all the time, so different vaccines may be made every year. To stay protected against influenza, you need to be re-vaccinated every year before the winter season.

It is particularly important for some groups of people to be vaccinated. These include people with certain medical conditions, elderly people, people who are likely to be exposed to the infection and people on certain medications. If you are in doubt as to whether you should be vaccinated, talk to your local health care professionals.

INFLUVAC complies with the World Health Organization (WHO) and National Advisory Committee on Immunization (NACI) recommendations for vaccination in the northern hemisphere for the 2015/2016 season.

##### When it should not be used:

INFLUVAC vaccine is made in eggs; therefore this vaccine should not be given to anyone with allergies and especially severe allergies (anaphylactic reactions) to chicken eggs or egg products.

INFLUVAC should not be given to people who have allergies to the active substances, to any of the excipients and to residues of eggs, chicken protein, formaldehyde, cetyltrimethylammonium bromide, polysorbate 80, or gentamicin. For a complete listing of excipients, see the **DOSAGE FORMS, COMPOSITION AND PACKAGING** section of the Product Monograph.

Anyone who has experienced allergic reactions to a previous dose of influenza vaccine **SHOULD NOT** be vaccinated with INFLUVAC.

##### What the medicinal ingredient is:

The medicinal ingredient is surface antigens neuraminidase and hemagglutinin of the following viruses as recommended by WHO and the NACI: an A/California/7/2009 (H1N1)pdm09-like virus, an A/Switzerland/9715293/2013 (H3N2)-like virus, a B/Phuket/3073/2013-like virus.

##### What the other ingredients are:

Potassium chloride, potassium dihydrogen phosphate, disodium phosphate dihydrate, sodium chloride, calcium chloride dihydrate, magnesium chloride hexahydrate, and water for injection.

For a full listing of other (non-medicinal) ingredients, see the **DOSAGE FORMS, COMPOSITION AND PACKAGING** section of the Product Monograph.

##### What dosage forms it comes in:

INFLUVAC comes in a 0.5 mL pre-filled syringe for injection, List no. 0W184, containing neuraminidase and 15 mcg hemagglutinin of each of the following virus strains:  
- A/California/7/2009 (H1N1)pdm09- like strain (A/California/7/2009, X-181)  
-A/Switzerland/9715293/2013 (H3N2)-like strain (A/Switzerland/9715293/2013, NIB-88)  
-B/Phuket/3073/2013-like strain (B/Phuket/3073/2013, wild type)

#### WARNINGS AND PRECAUTIONS

**Serious Warnings and Precautions**  
**INFLUVAC should not be used in individuals who are allergic to eggs, previous doses of the flu vaccine, or any components of the flu vaccine.**

BEFORE you use INFLUVAC talk to your doctor or pharmacist if:

- you are allergic to eggs or egg-products
- you are allergic to any of the following: formaldehyde, cetyltrimethylammonium bromide, polysorbate 80 or gentamicin
- you have a fever, or you think you may be getting a fever
- you had a serious reaction to any flu vaccine in the past
- you have any known allergies
- you have experienced any health problems
- you are pregnant
- you are currently on any medication (i.e., immunosuppressants, theophylline, anticoagulants such as warfarin).

## INTERACTIONS WITH THIS MEDICATION

Drugs that may interact with INFLUVAC include: immunosuppressants, theophylline, anticoagulants such as warfarin.

## PROPER USE OF THIS MEDICATION

### Usual Dose:

One dose of 0.5 mL pre-filled syringe containing neuraminidase and 15 mcg hemagglutinin per viral strain as recommended by WHO and NACI.

Adults: 0.5 mL, single dose.

INFLUVAC comes as a 0.5 mL suspension, ready for intramuscular or deep subcutaneous injection. Allow the vaccine to reach room temperature before use. Shake well before use.

### Overdose:

Overdosage is unlikely to have any bad effect.

In case of drug overdose, contact a health care practitioner, hospital emergency department or regional Poison Control Centre immediately, even if there are no symptoms.

### Missed Dose:

Not applicable

## SIDE EFFECTS AND WHAT TO DO ABOUT THEM

Occasionally people have side effects with influenza vaccines. The most common of these are fever, feeling unwell, shivering, tiredness, headache, sweating, muscle or joint pain, and warmth. Skin reactions include redness, swelling, pain, ecchymosis (blue/black staining of the skin), a hardening of the skin at the injection site and itching.

These reactions will normally disappear without treatment in a day or two.

Rarely, neuralgia (nerve pain), paresthesia (numbness and tingling), convulsions (seizures) and temporary thrombocytopenia (a blood disorder) have been reported. In rare cases, allergic reactions may lead to shock.

Very rarely, vasculitis (inflammation of blood vessels) temporarily affecting the kidneys, neurological disorders (affecting the nerves and brain) such as encephalomyelitis, neuritis and Guillain Barré syndrome have been reported.

Allergic reactions (this might include but is not limited to breathing or swallowing difficulties, or swelling in the face or skin), and temporary enlargement of the lymph nodes have been reported.

If you think that you have a side effect not mentioned here, please tell your doctor or pharmacist.

SERIOUS SIDE EFFECTS, HOW OFTEN THEY HAPPEN AND WHAT TO DO ABOUT THEM					
Symptom / effect		Talk with your doctor or pharmacist		Stop taking drug and call your doctor or pharmacist	
		Only if severe	In all cases		
Common	fever	X			
	feeling unwell	X			
	shivering	X			
	tiredness	X			
	headache	X			
	sweating	X			
	muscle or joint pain	X			
	<u>Skin Reactions</u>				
	redness	X			
	swelling	X			
	pain	X			
	ecchymosis (blue/black staining of the skin)	X			
	reddening of the skin at the injection site	X			
	Uncommon	nerve pain		X	
numbness and tingling			X		
convulsions (seizures)			X		
temporary thrombocytopenia (a blood disorder)			X		
allergic reactions			X		
inflammation of blood vessels			X		
temporarily affecting the kidneys					
brain disorders			X		
Guillain Barré syndrome			X		

*This is not a complete list of side effects. For any unexpected effects while taking INFLUVAC, contact your doctor or pharmacist.*

## HOW TO STORE IT

INFLUVAC should only be given by a health care professional

Store INFLUVAC at 2 to 8°C (in a refrigerator).

Do not freeze. Store in the original package in order to protect from light.

Do not use after the expiry date.

This vaccine is effective against this year's 2015/2016 influenza virus.

### **REPORTING SUSPECTED SIDE EFFECTS**

To monitor vaccine safety, the Public Health Agency of Canada collects case reports on adverse events following vaccination.

#### **For Health Care Professionals:**

If a patient experiences an adverse event following immunization, please complete the appropriate Adverse Events Following Immunization (AEFI) Form and send it to your local Health Unit in **your province/territory**.

#### **For the General Public:**

Should you experience an adverse event following immunization, please ask your doctor, nurse or pharmacist to complete the Adverse Events Following Immunization (AEFI) Form.

If you have any questions or have difficulties contacting your local health unit, please contact the Vaccine Safety Section at the Public Health Agency of Canada.

**By toll-free telephone:** 866-844-0018  
**By toll-free fax:** 866-844-5931  
**E-mail:** caefi@phac-aspc.gc.ca  
**Web:** <http://www.phac-aspc.gc.ca/im/vs-sv/index-eng.php>

**Mail:**  
**The Public Health Agency of Canada**  
**Vaccine Safety Section**  
**130 Colonnade Road, A/L 6502A**  
**Ottawa, ON K1A 0K9**

NOTE: Should you require information related to the management of the side effect, please contact your health care provider before notifying the Public Health Agency of Canada. The Public Health Agency of Canada does not provide medical advice.

### **MORE INFORMATION**

The most recent version of this document plus the full Product Monograph, prepared for health care professionals, can be found at: [www.hc-sc.gc.ca](http://www.hc-sc.gc.ca) (Drug Product Database) or at [www.mylan.ca](http://www.mylan.ca) or by contacting the sponsor, BGP Pharma ULC, Etobicoke, Ontario, M8Z 2S6 at: 1-844-596-9526

This leaflet was prepared by BGP PharmaULC

® Registered Trademark Abbott Biologicals B.V., licensed use by BGP Pharma ULC, Etobicoke, Ontario, M8Z 2S6

Last revised: January 8, 2016