# Seroprevalence of HbsAg, Anti-HBc and Anti-HCV in Southern Brazil, 1999-2001

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**The prevalence of infection by the hepatitis B (HBV) and C (HCV) viruses varies among geographical regions. We evaluated 263,795 blood donor samples collected from 1999-2001 in various cities in the state of Santa Catarina to determine the prevalence of HbsAg, anti-HBc and anti-HCV markers. The markers were analyzed by immunoenzymatic tests, as determined by the Ministry of Health, and the data were obtained from blood banks and from ANVISA (the Brazilian National Agency for Sanitary Vigilance). There was a significant reduction in the mean frequency of HbsAg and anti-HBc during the study period, from 0.98% to 0.64% and from 8.83% to 5.35%, respectively, though they varied considerably among the different regions. There was also a decrease in the mean frequency of anti-HCV, although it was not significant, decreasing from 0.38% to 0.34%. Even with this reduction, the frequency of these markers was still high compared with that found in other countries, indicating high rates of infection by hepatitis B and C viruses. This emphasizes the urgency of vaccination programs against HBV, especially in some regions of Santa Catarina state, in order to reduce the prevalence of this infection and consequently reduce the risk of transmission through sexual relations or from the donation of blood and/or hemocomponents.**

**Key Words: Blood donors, hepatitis B, hepatitis C, HbsAg, anti-HBc, anti-HCV.**

Infection by the hepatitis B (HBV) and hepatitis C (HCV) viruses is the most common cause of post-transfusion hepatitis [1,2]. However, with the emergence of HIV infection more emphasis has been given to the control of blood utilized in transfusions and in 1993 it became obligatory, in Brazil, to screen blood donors for HBV and HCV [3]. Furthermore, HBV and HCV are also the most frequent causes of chronic hepatitic diseases in the world, and their transmission occurs, mainly, through direct contact with blood, through the utilization of intravenous drugs, blood transfusions and/or hemocomponents, and through sexual relations. However, sexual relations seem not to be the most frequent mode of HCV transmission [4].

Infection by these two viruses may induce chronic hepatitis, which may progress to cirrhosis, and eventually to hepatocellular carcinoma [5-8]. It is estimated that around 350 million people in the world are chronic carriers of HBV, which represents approximately 7% of the total population [9], whereas infection with HCV is found in approximately 3% of the world population, which represents 160 million people [10-12]. This high prevalence of HBV and/or HCV certainly results in high medical costs, due to a great number of cases of fulminating hepatitis, hepatic cirrhosis and carcinoma, and also provokes the death of a significant part of the population by these pathologies.

Studies show that a co-infection by HBV and HCV is as frequent in Asia [13,14] as it is in western countries [15,16], varying from 10% to 15% in patients who are chronically infected by HBV. Patients

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infected simultaneously by HBV and HCV are more frequently infected with the more severe hepatitic diseases and are at a significantly greater risk of developing fulminant hepatitis, hepatic cirrhosis and carcinoma [17,18], particularly in the underdeveloped and/or developing countries, where the prevalence of simultaneous infections by these viruses appears to be higher. Also, the high prevalence of HBV and HCV may result in an increase in the risk of transmission of these viruses through the transfusion of hemocomponents, since it is not possible to totally guarantee the absence of these infections among blood donors through the serologic tests utilized routinely in the screening of blood donors [19].

We evaluated the prevalence of HbsAg, anti-HBc and anti-HCV markers among blood donors of the different regions of the state of Santa Catarina, Brazil, in 1999, 2000 and 2001.

## Materials and Methods

The data were obtained from the data processing centers of the blood banks of the Centro Hemoterápico Blumenau (Blumenau Hemotherapeutic Center - Blumenau-SC), Hospital Dona Helena (Dona Helena Hospital - Joinville-SC), Hemocentro Jaraguaense LTDA (Jaraguaense Hemocenter Ltd - Jaraguá do Sul-SC), Banco de Sangue do Hospital Universitário (University Hospital Blood Bank - Florianópolis - SC), Centro de Hematologia e Hemoterapia de Santa Catarina– Hemosc – (Hematology and Hemotherapy Center of Santa Catarina - Florianópolis-SC) and Agência de Vigilância Sanitária ANVISA - (National Health Agency) [20].

The research on markers of infection by HBV and by HCV was carried out by immunoenzymatic tests according to Ministry of Health directives No. 1376 of 1993 and No. 121 of 1995.

## Results

The prevalence of HbsAg and anti-HBc markers varied among the different regions of the state of Santa Catarina; from 1999 and 2001 the mean prevalence in the state declined progressively. The highest prevalence of these two markers was found in the region of the town of Chapecó, in western Santa Catarina (Tables 1 and 2).

The mean prevalence of anti-HCV in the state of Santa Catarina did not change significantly from 1999 to 2001, though it varied among regions (Table 3).

## Discussion

Blood donors are interviewed with screening questionnaires, which have evolved over the years [21,22]. In the United States, since 1992, following recommendations from the Food and Drug Administration, donors are directly questioned about behavioral habits [23]. This modification in the screening of the donors resulted in a decrease in the prevalence of HCV from 0.63% in 1992 to 0.40% in 1996 among new blood donors [24], whereas among the general population, at the same time, the prevalence of this virus was 1.8% [25]. In the case of HbsAg, a prevalence close to 0.2% was found, and there was no significant change from 1991 to 1996 [22]. In Brazil, where there is greater endemicity of HBV, as we know that the prevalence of HbsAg and anti-HBc among the blood donors in 2001 was similar to the prevalence among the general population of Germany [26], it appears that the anti-HBc research has assisted in the identification of HBV carriers who are seronegative for HbsAg [27].

The prevalence of infection by HCV among the blood donors in the state of Santa Catarina in 1999 was similar to that found among new blood donors in the United States in 1996 [24,28]. In Santa Catarina, the prevalence of HCV among blood donors decreased considerably between 1994/1995 and 1999 [19,28], but there was only a small reduction between 1999 and 2001. Among blood donors in the state of Santa Catarina there was a significant decrease in the prevalence of HbsAg and anti-HBc between 1999 and 2001 (Tables 1 and 2). However, the mean frequency of the markers of infection by HBV (HbsAg and anti-HBc) among blood donors in the state of Santa Catarina from 1999 to 2001 only decreased to levels similar to

**Table 1.** Prevalence of HbsAg among blood donors of the main regional blood banks of Santa Catarina

| Year and | 1999 | | 2000 | | 2001 | |
|---|---|---|---|---|---|---|
| **Location** | **N** | **%** | **N** | **%** | **N** | **%** |
| Florianópolis | 176/24.570 | 0.71 | 280/24.274 | 1.15 | 159/27.396 | 0.58 |
| Lages | 17/6.626 | 0.26 | 16/5.899 | 0.27 | 24/6.509 | 0.37 |
| Joaçaba | 64/8.036 | 0.80 | 30/5.633 | 0.53 | 27/5.668 | 0.48 |
| Chapecó | 375/11.713 | 3.20 | 149/9.132 | 1.63 | 122/7.909 | 1.54 |
| Criciúma | 36/7.193 | 0.50 | 20/6.858 | 0.29 | 23/7.493 | 0.31 |
| Joinville | 86/14.715 | 0.58 | 63/13.957 | 0.45 | 79/14.994 | 0.53 |
| Tubarão | 27/2.420 | 1.12 | 7/2.899 | 0.24 | 22/2.804 | 0.78 |
| Blumenau | 92/13.704 | 0.67 | 106/13.407 | 0.79 | 85/12.580 | 0.85 |
| Jaraguá do Sul | 20/2.201 | 0.91 | 17/2.317 | 0.73 | 20/2.888 | 0.69 |
| **Total** | **893/91.358** | **0.98** | **688/84.376** | **0.84** | **561/88.241** | **0.64** |

**Table 2.** Prevalence of anti-HBc among blood donors of the main regional blood banks of Santa Catarina

| Year | 1999 | | 2000 | | 2001 | |
|---|---|---|---|---|---|---|
| **Location** | **N** | **%** | **N** | **%** | **N** | **%** |
| Florianópolis | 1.303/24.570 | 5.30 | 1.097/24.274 | 4.52 | 968/27.396 | 3.53 |
| Lages | 157/6.626 | 2.37 | 106/5.899 | 1.80 | 138/6.509 | 2.12 |
| Joaçaba | 736/8.036 | 9.16 | 354/5.633 | 6.28 | 247/5.668 | 4.36 |
| Chapecó | 3.401/11.713 | 29.04 | 1.632/9.132 | 18.09 | 1.066/7.909 | 12.72 |
| Criciúma | 469/7.193 | 6.52 | 263/6.858 | 3.83 | 221/7.493 | 2.95 |
| Joinville | 1.055/14.715 | 7.17 | 951/13.957 | 6.81 | 635/14.994 | 4.23 |
| Tubarão | 134/2.420 | 5.54 | 79/2.899 | 2.73 | 110/2.804 | 3.92 |
| Blumenau | 565/13.704 | 4.12 | 1.251/13.407 | 9.33 | 1.164/12.580 | 9.25 |
| Jaraguá do Sul | 244/2.201 | 11.10 | 17/2.312.317 | 9.97 | 234/2.888 | 8.10 |
| **Total** | **8.064/91.358** | **8.83** | **5.984/84.376** | **7.09** | **4.723/88.241** | **5.35** |

**Table 3.** Prevalence of anti-HCV among blood donors of the main regional blood banks of Santa Catarina

| Year | 1999 | | 2000 | | 2001 | |
|---|---|---|---|---|---|---|
| **Location** | **N** | **%** | **N** | **%** | **N** | **%** |
| Florianópolis | 133/24.570 | 0.54 | 80/24.274 | 0.33 | 102/27.396 | 0.46 |
| Lages | 18/6.626 | 0.27 | 10/5.899 | 0.17 | 17/6.509 | 0.26 |
| Joaçaba | 17/8.036 | 0.21 | 10/5.633 | 0.18 | 23/5.668 | 0.41 |
| Chapecó | 39/11.713 | 0.33 | 17/9.132 | 0.19 | 17/7.909 | 0.21 |
| Criciúma | 42/7.193 | 0.58 | 27/6.858 | 0.39 | 30/7.493 | 0.40 |
| Joinville | 27/14.715 | 0.58 | 26/13.957 | 0.19 | 27/14.994 | 0.18 |
| Tubarão | 25/2.420 | 0.18 | 10/2.899 | 0.34 | 9/2.804 | 0.32 |
| Blumenau | 36/13.704 | 1.03 | 81/13.407 | 0.60 | 74/12.580 | 0.59 |
| Jaraguá do Sul | 9/2.201 | 0.26 | 1/2.317 | 0.04 | 5/2.888 | 0.17 |
| **Total** | **346/91.358** | **0.38** | **262/84.376** | **0.31** | **304/88.241** | **0.34** |

those found in Germany population during the same period, while the frequency of the marker of HCV infection (anti-HCV) was approximately 50% lower [29], though it was approximately five times greater than that found between 1991 and 1993 in blood donors in the United States [30].

The reduction in the prevalence of markers of HBV and HCV infection, which signified a significant reduction in the residual risk of transmission of these infections through blood transfusion, may be attributed to the introduction of the third generation ELISA tests, which increased the detection sensitivity for these viruses, reducing the window of detection, and also due to the effort employed by the blood banks in recruiting a greater number of volunteers who donate blood periodically. This is also a consequence of the efforts aimed at detecting behavior that increases the risk of infection by these viral agents and by HIV [21,31], which results in the exclusion and/or auto-exclusion of suspect donors. This reduction is also due to recent efforts to vaccinate children and fertile age women against hepatitis B.

Nevertheless, a residual risk of transmission of HBV and HCV by transfusion of contaminated blood persists, as a consequence of the infectious window period [21]. This risk could be reduced even more through the introduction of tests based on the polymerase chain reaction (PCR) or the increase in nucleic acids (NAT), since these tests, developed at the end of the last decade [32-35] have greater sensitivity and specificity, thereby decreasing the amplitude of the infectious window period and the residual risk of transmission via blood transfusion. However, although the cost-benefit relation may seem low for developed countries, developing counties are evaluating their utilization in areas where high prevalence of these infections has been found [21].

The average residual risks of transmission of HBV and HCV infection, 1:2077 and 1:13721, respectively, is still very high in Florianópolis, SC, Brasil, [21], when we compare these figures to those known from the United States in 1996, 1:63,000 and 1:103,000, respectively [36].

Given the high prevalence of HBV markers in the different regions of the state of Santa Catarina, the high risk of transmission of HBV infection through transfusions and the high degree of success attained by the mass vaccination programs against hepatitis B, implemented in Taiwan and Saudi Arabia, which resulted in drastic reductions in the prevalence of HbsAg and anti-HBc markers in the populations of these two countries, after 8 and 15 years, respectively [37,38], efforts should be made to implement mass hepatitis B vaccination campaigns for the population from 0-15 years of age and for fertile age women, in order to reduce the prevalence of HBV among the population and thereby more rapidly reduce the risk of transmission of this virus. This type of measure seems to be even more urgent in regions of high prevalence, such as Chapecó, located in western Santa Catarina, where the prevalence of HbsAg and anti-HBc markers among blood donors, found from 1999 to 2001, was approximately three times greater than the state average; sexual transmission and transmission through blood transfusions may be interacting in this region, increasing the total risk of transmission of HBV and thereby progressively increasing the prevalence of the markers of this infection.

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