RESULTS FROM THE BLOOD BANK SCREENING IN TURKEY

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Content of the presentation

- A short review about the blood bank organization in our country
- Measures taken in blood banks to prevent transmission of HBV / HCV and the current status in Turkey
- Results from blood bank screenings
- What to do more to minimize the risk of transfusion transmitted HBV and HCV infections

Blood Bank Organization in Turkey

- Hospital Blood Banks
  - Public hospitals (State hospitals)
  - University hospitals
  - Private hospitals
  - Military hospitals
- Red Crescent Blood Banks

Donation / year > 5.000	65 blood bank
Donation / year > 10.000	27 blood bank
Donation / year > 20.000	10 blood bank

Total about 400

1.800.000 U of Red Cell Susp / Year

New Blood Law – April 2007

- Regional blood banks
  - Will collect blood, perform screening tests and prepare and store all kind of components. Send them systematically to the transfusion centers.
- Transfusion centers (in hospitals)
  - Will store a amount of blood components how much it needs, perform cross-match testing and antiglobulin tests.
- Blood collection centers
  - Centers where the blood is collected from donors and send to the regional blood bank.

Current status of blood banks

- Now we are in a transition period
- The Red Cresent Blood Banks begins to be organized as regional blood banks
  - The rate of blood wich is collected from Turkish Red Cresent arised to 40-44 % in the last year
- All hospital blood banks will transform to “transfusion centers”
- It is foreseen that this transformation will be completed in 2013-2014

Measures taken in blood banks to prevent transmission of HBV and HCV

- Donor assessment
- Screening tests
- Quarantine
- Pathogen inactivation

Donor assessment

- Donor questionnaire and selection to eliminate high-risk donors
- Practiced in all blood banks, standard donor questioning forms are used
- Unknown routes of transmission of HBV /HVC (25-40%)
- Truthfulness of the donor declarations
  - The majority of donors are first-time donors
  - Very few voluntary-regular donors

Quarantine

- Only for fresh frozen plasma
- First screening and collection of blood (donor can be in the seronegative / window period) → quarantine → invitation of the donor for the second test → if nonreactive put the plasma in service
- What about the used red cell suspension?
- Recall of donors is problematic
- Currently not used in Turkey

Pathogen Inactivation

- Used in some developed countries
  - Not in all blood banks
- For fresh frozen plasma since more than 15 years (USA and Europa)
- Recently for platellet suspensions (Europa)
- Studies for red cell suspensions and whole blood
- Cost-effectiveness is under debate
- Not used in Turkey yet

Screening tests

- Mandatory tests
  - **HBsAg (minimum sensitivity 0,5 IU/mL)**
  - **Anti-HCV (± HCVcorAg)**
  - Anti-HIV I-II-g0 ± HIV Ag (p24)
  - Screening for Syphilis
- Peformed in all blood banks
- High sensitive 3rd generation immunoassays (EIA, ChLIA)
- Quick test only in emergency situations, in a few very small blood banks

Screening results

- The donors are people who “seems to be healthy”
- Seroprevalances of infectious diseases are lower in donor populations compared to the general population because the pre-screening elimination of high-risk donors

The change in our seropositivity rates

- 28 blood banks, n=1.060.087 donors
- HBsAg
  - 1995: 5,6 %
  - 1999: 3,3 %
- Anti-HCV (since 1996)
  - Arised form 0,2 % to 0,6 % in 1999
  - Improvement of the anti-HCV tests

Study of Blood Banks and Transfusion Society of Turkey, 2000

The change in our seropositivity rates

- n= 6.240.130 donors
- HBsAg
  - 1989: 4,19 %
  - 2004: 2,1 %
- Anti-HCV
  - No change: 0,38%

Study of Emekdaş G et all, 2005

Uludag University, Bursa

Year	HBsAg (%)	Anti-HCV (%)	Number of donors (n)
1998	3,53	0,74	11.201
1999	3,67	0,72	22.020
2000	2,3	0,71	23.832
2001	2,78	0,8	27.466
2002	2,36	0,65	22.169
2003	2,2	0,8	17.090
2004	1,89	0,7	18.810
2005	1,72	0,77	21.285
2006	1,41	0,62	18.528
2007	1,32	0,43	16.351
2008	1,06	0,6	17.390
2009 (first 9 months)	1,18	0,62	12.637
Total (12 years)	**2,1**	**0,68**	**2.287.779**

Gazi University, Ankara

Year	HBsAg (%)	Anti-HCV (%)	Number of donors (n)
1996	2,47	0,8	7.728
1997	2,17	0,44	7.718
1998	2,21	0,62	10.988
1999	2,1	1,1	9.921
2000	1,64	0,53	9.215
2001	2,13	0,6	10.792
2002	1,1	0,19	12.281
2003	0,81	0,09	13.970
2004	0,88	0,18	16.913
2005	0,96	0,31	16.553
2006	0,87	0,01	17.836
Total (11 years)	**1,57**	**0,44**	**133.915**

Tepecik Research&Training Hospital, Izmir

Year	HBsAg (%)	Anti-HCV (%)	Number of donors (n)
2002	2,1	0,37	13.937
2003	2,16	0,37	14.765
2004	1,92	0,80	14.467
2005	1,75	0,69	11.448
2006	1,9	0,46	6.756
Total (5 years)	**1,96**	**0,54**	**61.371**

Istanbul Research & Training Hospital,

Year	HBsAg (%)	Anti-HCV (%)	Number of donors (n)
2000	3,69	0,63	6.454
2001	3,91	0,25	6.746
2002	3,65	0,56	5.897
2003	2,89	0,29	5.883
2004	2,75	0,30	6.879
2005	2,36	0,23	5.981
2006	2,08	0,05	7.305
2007 (first 6 months)	1,81	0,13	5.350
Total (8,5 years)	**2,9**	**0,30**	**50.495**

Regional differences

Blood Bank / Region	Years	Number of donors (n)	HBsAg (%)	Anti-HCV (%)
Research and Teaching State Hospital Blood Bank / Trabzon- Black Sea Region	2004-2007	12.092	1,62 Decreased from 1,9 to 1,2	0,2 Decreased from 0,31 to 0,15
Süleyman Demirel University Blood Bank / Isparta- Mediterranean Region	2000-2007	51.361	1,09	0,44
Selçuk Meram University Blood Bank / Konya- Middle Anatolia	2006	54.266	0,6	0,1
Turkish Red Cresent Blood Banks / Middle Anatolia	2006	102.359	1,62	0,49
Turkish Red Cresent Blood Banks / Aegean Region	2004-2007	268.578	1,36 In Uşak-Kütahya 0,5	0,42

Possible explanations for the decrease

- Advences in blood banking
  - The effect of intensive and continuous education initiated by The Blood Banks and Transfusion Sociaty of Turkey and supported by the Ministry of Health
  - More attention in donor assessment !!
- Rise in puplic awareness
  - About transfusion transmitted infections, HBV, HCV, vaccination, prevention etc. Many people are screened and vaccinated through their own wish.
- Vaccinations
  - Adult vaccination
  - The effect of the vaccination program in children which begun in 1998 will be observed in the next decade

What to do more?

- Anti-HBc testing
- NAT (Nucleic acid testing)
- HCV cor Ag testing

Anti-HBc

- Window period and occult HBV infections !!
- Anti-HBc positivity rates in
  - HBsAg negative donors 18 %
  - HBsAg and anti-HBs negative donors 2,7 %

Bal SH et all. Mikrobiol Bul (43), 2007

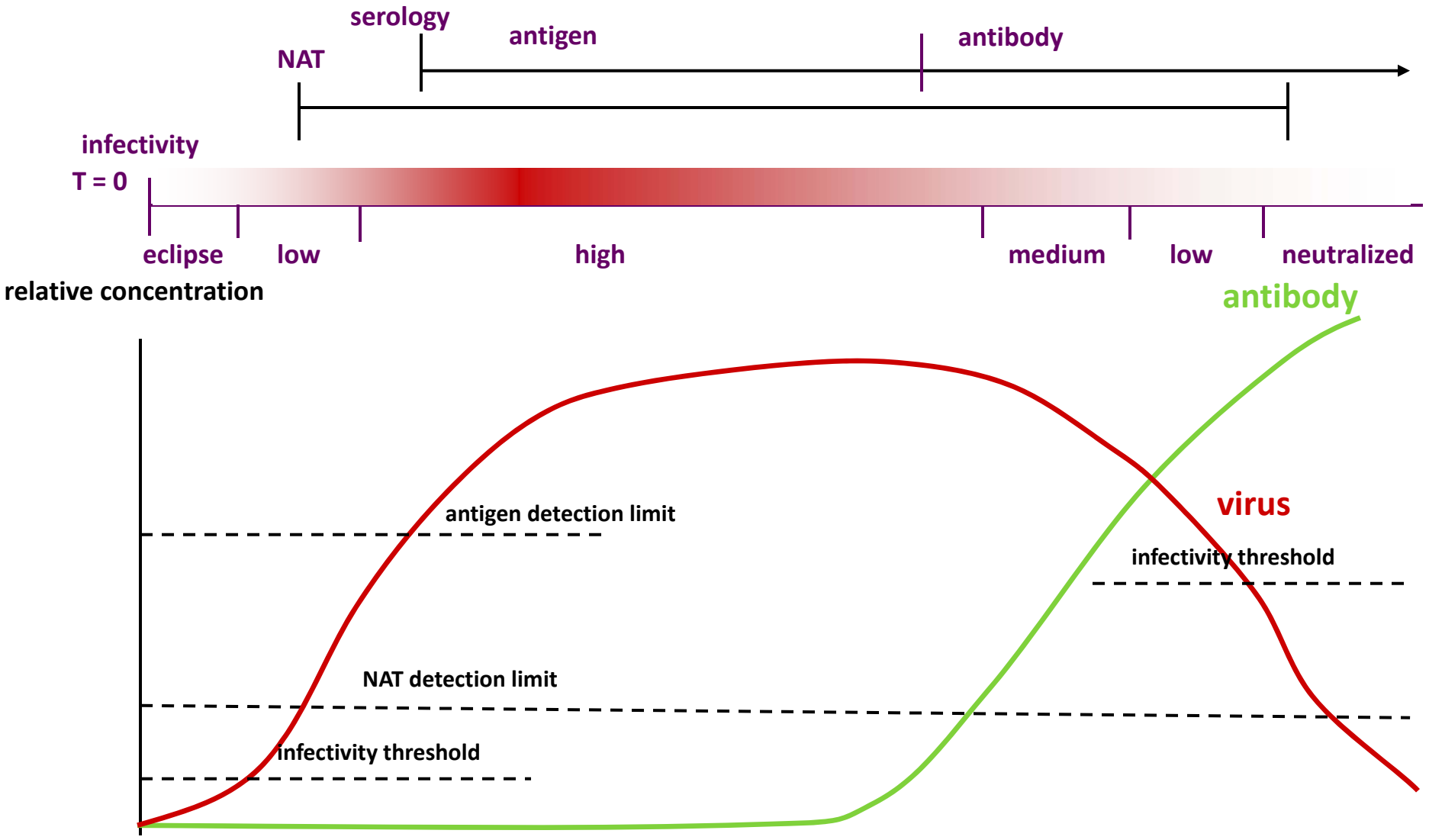
- Loss of donors (how many of them are infectious?)
- Initially screen for HBsAg, then consecutively for anti-HBs and anti-HBc will not be practical and cost-effective
- The majority of our donors are first time donors
  - This proportion will definitely be decreased in regular voluntary donors

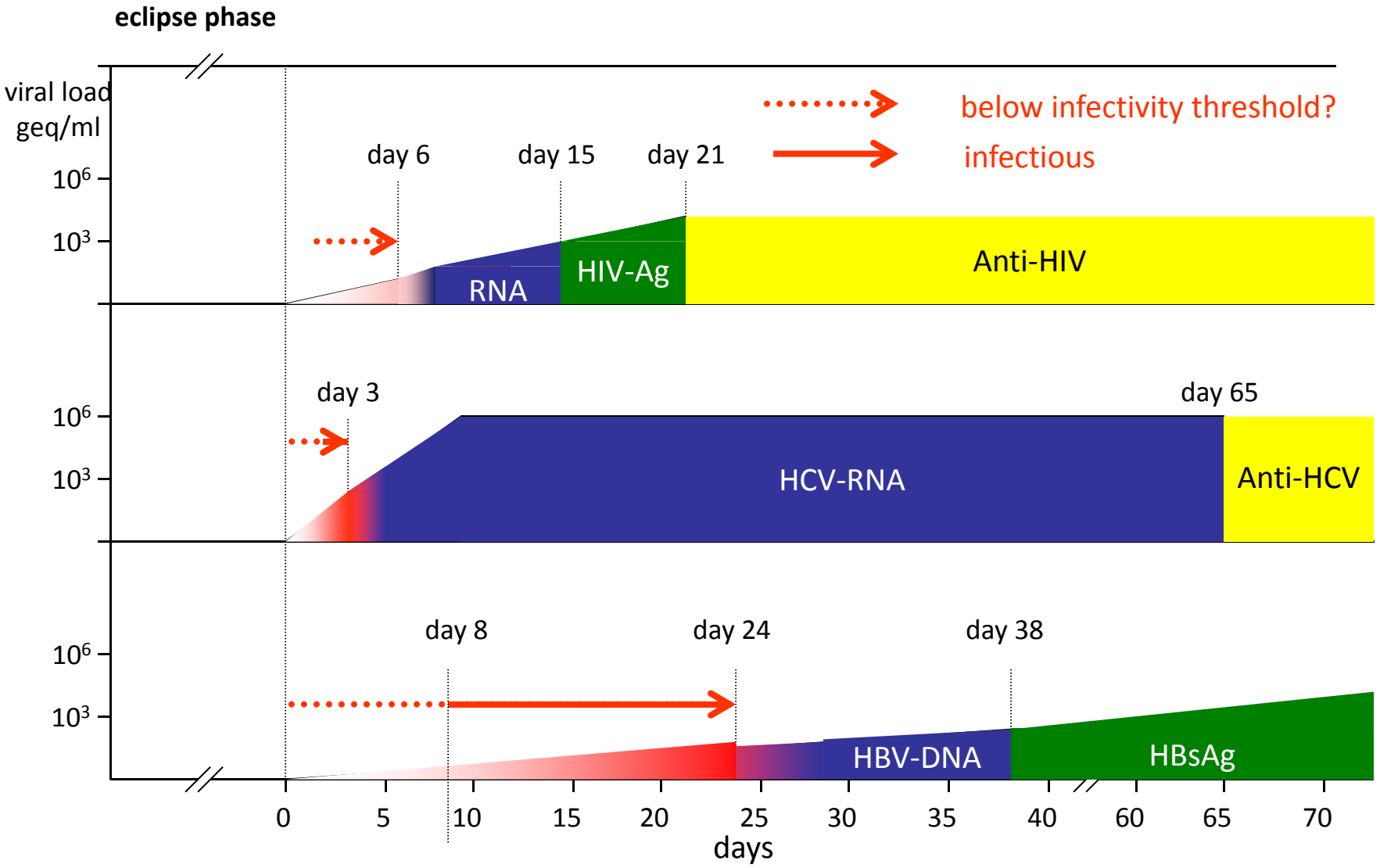
How many of HBsAg negative, but anti-HBc positive donors are infectious?

- 9282 HBsAg non-reactive donors
- Anti-HBc, anti-HBs, HBV-DNA (Real-time PCR)
- HBV-DNA was performed only in isoleted anti-HBc reaktive donors
- HBV-DNA positive in one **(1 / 8.333 donation**)
- HBV-DNA positive in
  - 0, 012 % of HBsAg non-reactive donors
  - 0,45 % of isolated anti-HBc reactive donors

Bal SH et all. Mikrobiol Bul (43), 2007

Nucleic acid testing




eclipse phase
viral load
geq/ml
10^6
10^3
day 6
day 15
day 21
below infectivity threshold?
infectious
RNA
HIV-Ag
Anti-HIV
day 3
day 65
HCV-RNA
Anti-HCV
day 8
day 24
day 38
HBV-DNA
HBsAg
0
5
10
15
20
25
30
35
40
60
65
70
days

NAT in Europa

- HCV-RNA is mandatory in plasma fractionation (1999)
- HIV-RNA is mandatory in France and Holland (2001), Belgium and Switzerland (2002), Poland (2003), Germany (2004)
- HCV-RNA is mandatory in Austria, Germany, Holland, and Switzerland (1999), Finland, Norway and Slovenia (2000) , France and Poland (2001), Belgium and Italy(2002), Spain (2003)
- Optionally: England, Ireland, Luxemburg, Portugal, Greece
- HBV-NAT introduced in Austria, Germany, Italy, Lithuania, Poland, Spain, Portugal, Greece

Study of Turkish Red Crescent

- 18.200 donors (February 2007-September 2008)
- Serology + ID-NAT (Cobas-ROCHE and Tigris-CHIRON)

- 314 HBsAg reactive (1,72 %)
- 17.886 HBsAg non-reactive
  - 11 HBV-DNA positive (1 / 1626)

- 62 anti-HCV reactive (0,34 %)
- 18.138 anti-HCV non-reactive
  - 2 HCV-RNA positive (1 / 9069)

Altunay H et all. XIV. KLIMIK Kongresi, 2009

- These results are well-above the calculated estimates
- It may be argued whether or not these cases reflect true positivity and the potential method of confirmation is also another subject of debate
- Further studies are required

False positive?

- 4.484 donors (January 2005 – March 2006)
- Minipools, Real-Time PCR
  - 186 minipols from 24, one minipool from 20 samples
- 3 minipool reactive
- Test repeated (double): 2 minipool reactive
- ID-test in 48: 3 (1+2) reactive
- Test repeated (double): 2 reactive
- Recall of the reactive donors (new blood samples): All HBV markers negative

Karakoç AE. II. Ulusal Kan Merkezleri ve Transfüzyon Tıbbı Kongresi, 2007

- Talasemia Center, Antalya
- 388 Talasemia patients, 246 of them needs regulary transfusions every 2-4 week
- HCV infection rates in transfused patients
  - 1994 → 25,2 %
  - 1997 → 29,8 %
  - 2006 → 28,4 %
- NAT is cost-effective in this population

Canatan D. II. Ulusal Kan Merkezleri ve Transfüzyon Tıbbı Kongresi, 2007

Yield of NAT

- Transmission through transfusion depends on the viral load, the quantity of the infected product and the immunocompetence of the recipient. Therefore it is not easy to estimate how many transfusion transmitted HBV and HCV infections are reduced by NAT.
- More studies are needed
- Hemovigilans data
- Turkish Red Crescent will initiate the implementation of NAT testing in the regional blood banks

HCV cor Ag test

- Appropriate for blood banks
- Results are compatable with HCV-NAT
- Not used yet in any of our blood banks
- Studies will begin recently

Conclusion

- Seropositivity rates in the donor population is decreasing
  - Advences in blood banking
  - Rise in puplic awareness
  - Adult vaccination
- We believe that regional blood banks will provide more advences in blood banking
  - Changes in donor profile
  - Hemovigilans
  - Implementation of NAT, HCV cor Ag tests, and also pathogen inactivation