Formaldehyde is widely used fixative. Its advantages are low cost, simplicity of use and good fixation traits, which are fast tissue penetration, good preservation of morphological structures and compatibility with downstream histological applications. Formaldehyde disadvantages are negative effects on nucleic acids. Formaldehyde solutions modify primary structure of deoxyribonucleic acid (DNA), fragment DNA and create protein-DNA covalent bonds that hinder DNA isolation procedures. Level of negative effects of formaldehyde is dependent on many factors. Effect of formaldehyde chemical composition (formaldehyde dilution, presence of buffer or formic acid) and effect of fixation length were studied in this work. On DNA extracted from fixed tissues, DNA quantity and level of DNA fragmentation were studied by quantitative polymerase chain reaction, fluorescence assay for DNA quantification and by on-chip electrophoresis on bioanalyzer Agilent 2100. Quality and quantity of acquired DNA were tested by DNA profile determination for identification purposes using STR (short tandem repeats) analysis. Results show that of all tested fixatives, buffered 4% formaldehyde is the most suited solution in regards of sufficient amount of DNA and sufficient DNA quality. Other formaldehyde variants (non-buffered 4% formaldehyde, non-buffered 36% formaldehyde and formaldehyde solutions with addition of formic acid or sodium hydroxide) worsened quality and quantity of acquired DNA more than buffered 4% formaldehyde. It was also shown that the longer the tissue is fixed the less DNA in worse quality is obtained.